UTS
UNIVERSITY
OF TECHNOLOGY
SYDNEY

FACULTY OF SCIENCE

HANDBOOK ◆ 1992

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UNIVERSITY OF TECHNOLOGY, SYDNEY

UTS has nine Faculties and each one has a separate Handbook which provides a detailed introduction to the Faculty's Undergraduate Courses.

Each Faculty also has a separate Postgraduate Studies Guide.

Reading these publications will show you how all courses at UTS aim to equip graduates for their professional career. Most courses can be undertaken with part-time attendance. Some are also offered with full-time and sandwich attendance. You do not have to be employed at the time you enrol in a sandwich pattern. And you can usually transfer from one attendance pattern to another at the end of a stage, provided the Head of School approves and there is space available in the class.

UTS does not offer external or correspondence courses.

Further information

The UTS Information Service is open all year in the Tower building at 15-73 Broadway (near Central Railway) and on the entrance level of Kuring-gai campus. If you can't visit them, write to PO Box 123 Broadway 2007 Australia or telephone (02) 330 1222 or (02) 413 8200.

Representatives of UTS attend Careers Days held in the Sydney region through the year.

Open Days are your chance to visit the campus and discuss your career plans and Course preferences with members of the Academic staff.

Applications for admission

If you want to be admitted or readmitted to a UTS Undergraduate course, apply to the Universities Admissions Centre by 27 September.

(There are some courses for which you can apply direct to UTS - the deadlines for these are advertised separately.)

If you want to enrol in a Doctoral programme or a Masters by Thesis, UTS will generally accept your application at any time.

For a Master of Arts, Master of Business or other higher degree by coursework, you should lodge your application with the University by 31 October.

EQUAL OPPORTUNITY

It is the policy of the University of Technology, Sydney to provide equal opportunity for all persons regardless of sex, race, marital status, physical ability, sexual preference, political conviction or religious belief.

MISSION

The mission of the University of Technology, Sydney is to provide higher education for professional practice which anticipates and responds to community needs and the effects of social and technological change. The University offers access to its human, physical and technological resources for the advancement of society. It is committed to freedom of enquiry and the pursuit of excellence in teaching, scholarship and research, and to interaction with the practising professions.

The University seeks to accomplish its mission in the following ways:

- by teaching an appropriate range of undergraduate, postgraduate and other educational programmes in a variety of attendance patterns for students wishing to enter the workforce at a professional level, those already employed at that level and those in employment who wish to attain that level.
- by ensuring that its courses are designed to enable graduates to carry out full professional practice in their chosen field. The courses aim to develop students' ability to learn, to solve problems, to adapt to change, and to communicate. Students should gain a broad understanding of social as well as technological issues, and acquire a greater perception of the nature and needs of modern society and of their responsibility to play a leading part in shaping it.
- by recognising that it has been established to serve the community as a major resource in vocational higher education. It therefore makes its technological expertise and facilities available to industry, commerce, government, and professional and community organisations. The means by which this is achieved include co-operative education, continuing education, pure and applied research and development, consulting, technology transfer and management, and contribution to national and regional policy development in education and technology.
- by promoting effective teaching and scholarship, professional activity and research by members of the University community to ensure the maintenance of high educational standards and their recognition at national and international levels.
- by continuing to develop and promote policies that ensure equality of opportunity in all its aspects.
- by seeking effective support for its educational activities
- by conducting regular consultative reviews of its mission and objectives.

STUDENT SERVICES

Student Services staff are employed by the University to cater for your health, counselling and welfare needs. Staff also assist in the development of study skills and provision for students with disabilities.

WELFARE

Welfare Officers offer assistance with your personal financial security. Central to their work is administration of the Student Loan Fund, and advising on Austudy claims and appeals.

HEALTH

The Health Service has two locations: Level 3A of the Broadway Tower on City campus and Level 5 of Kuring-gai campus. The practice offers a free service with an emphasis on Health Education and Promotion.

COUNSELLING

Counsellors are available on all campuses at least one day per week. They are experienced in dealing with personal difficulties and can advise on administrative matters in relation to the University, such as appeals against exclusion. If you suffer from exam nerves or loss of concentration, you're welcome to see one of the counsellors for assistance. They can also help you to clarify personal and career goals.

STUDY SKILLS

The Study Skills Counsellor, John Piechocki, helps students to understand how best they can learn. Advice is given on time management, writing assignments and how to read and comprehend more in less time. You don't need to have problems to see John - Study Skills counselling is about improving your performance.

ASSISTANCE FOR STUDENTS WITH DISABILITIES

The Special Needs Co-ordinator works with academic, administrative and Student Services staff to ensure appropriate support is available for students with disabilities. Students who have disabilities or chronic illness are encouraged to contact Marie Flood at Level 3A of City campus, Broadway. Telephone (02) 330 1183 or TTY (02) 330 1164 or Fax: (02) 330 1172

WHERE & WHEN TO FIND STUDENT SERVICES

Kuring-gai
Level 5
Monday to Friday 9-5

Broadway
Level 3A, Broadway Tower
Monday to Thursday 9-6
Friday 9-5

Haymarket
Room D105
Monday to Thursday 9-5

Balmain
Student Centre, White Bay
Tuesday & Wednesday 9-5

Gore Hill
Student Centre, 1st Floor
Clinical Studies Building, Level 1
Tuesday to Thursday 9-5

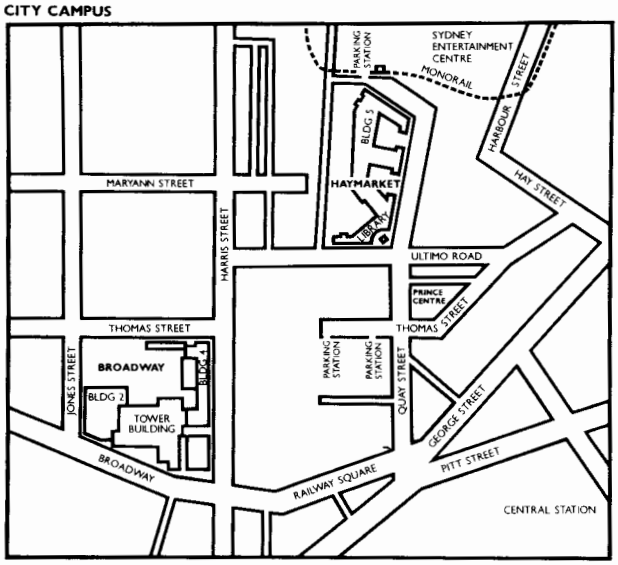
FACULTY LOCATION MAPS

Faculty of Science

Faculty Office:
Level 3, Building 4
Broadway, City Campus
(02) 330 1752

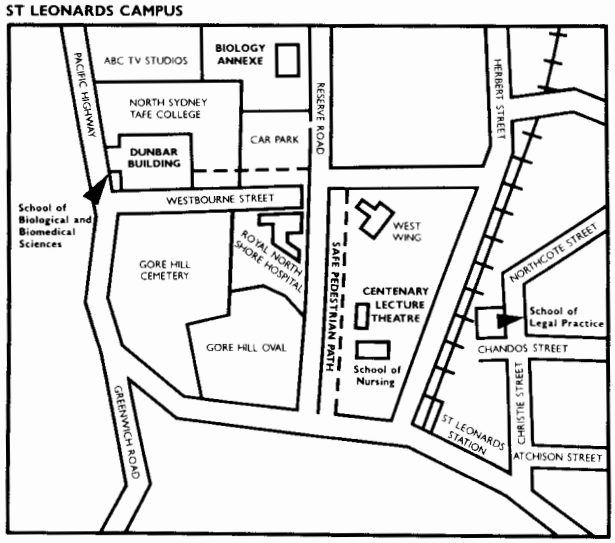
Postal Address:
PO Box 123,
Broadway NSW 2007

CITY CAMPUS



School of Physical Sciences
Level 3, Building 4
Broadway, City Campus
Telephone: (02) 330 1754

ST LEONARDS CAMPUS



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CONTENTS

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N B Woodland, BSc (UNE)

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D. Ma, MB BS (Hons) (NSW), MD (NSW), FRACP, FRCPA

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SCHOOL OF PHYSICAL SCIENCES

BACHELOR OF APPLIED SCIENCE (CHEMISTRY)

The purpose of this course is to provide a programme of instruction, which together with concurrent work experience, will prepare a student for entry to professional work in the field of applied chemistry. The course includes a firm foundation of study in the basic sciences, with in-depth development in the particular discipline of chemistry, emphasising its industrial applications.

By taking an appropriate selection from a range of subjects a student can prepare for laboratory, plant or sales work in industries concerned with plastics, paints, foods, metals and alloys, solvents or industrial chemicals.

The course consists of six stages and may be completed by a number of different patterns of attendance:

- two years of full-time attendance followed by one year in industry and one year of full-time attendance;
- two years of full-time attendance followed by two years of part-time attendance;
- six years of part-time attendance.

Other patterns of attendance may also be permitted.

Full-time attendance involves 24 hours per week at the University; this enables a full stage of the course to be completed in a semester.

Part-time attendance involves 12 or 13 hours per week at the University; with this form of attendance a full stage may be completed in one year. It is normal practice for employers to release part-time students for at least one half-day per week for attendance at classes. Students commonly attend the University for one half-day and three evenings per week, or for two half-days and two evenings per week.

The award for successful completion of the course is Bachelor of Applied Science. The award of honours may be made to any student judged to have performed meritoriously in the course, and who has submitted a satisfactory report on an advanced chemistry project. The course has been designed to meet the academic requirements for entry to corporate membership of the Royal Australian Chemical Institute.

Industrial training is regarded as an integral part of the course. The minimum period of relevant employment is one year full-time, or its equivalent. This experience is to be gained prior to or concurrent with the final stage of the course depending on whether attendance is full-time sandwich or part-time.
An Industrial Training Committee has been established within the Chemistry Department to provide guidance in the matter of appropriate vocational training. Students will be interviewed by this committee after completing Stage 2 of the course. Each student will then be assigned to a member of staff who will maintain regular contact during subsequent periods of study and employment.

SANDWICH PROGRAMME

STAGE 1

Autumn Semester		*Hours/Week*
62414	Chemistry 1M F/T	6
63211	Physics 1 F/T	6
91388	Concepts in Biology F/T	6
	or	
62311	Geology 1 F/T	6
31870	Introduction to Microcomputers	2
33170	Basic Science Mathematics	3
	or	
33171	Science Mathematics 1 F/T	4

STAGE 2

Spring Semester		
62423	Organic Chemistry 1	6
62424	Chemistry 2M	6
63221	Physics 2 F/T	6
33171	Science Mathematics 1 F/T	4
	or	
33172	Science Mathematics 2 F/T	3
31871	Computing for Science	3

STAGE 3

Autumn Semester		
62431	Structural Inorganic Chemistry	5
62433	Chemical Analysis 1	4
62436	Chemical Spectroscopy	5
63724	Materials Science 1	4
60031	Treatment of Scientific Data	3
33172	Science Mathematics 2	3
	or	
33173	Science Mathematics 3	3

Spring Semester		
62496	Industrial Training 1 **	6

STAGE 4

Autumn Semester		
62497	Industrial Training 2 **	6

Spring Semester		
62432	Organic Chemistry 2	5
62441	Physical Chemistry 1	6
62442	Electronics and Instrumentation	6
62443	Chemical Analysis 2	6
51368	Written and Oral Reporting	2

STAGE 5

Autumn Semester		*Hours/Week*
21139	Business Organisation	2
51357	Oral Communication	2

		Hours/Week
62453	Chemical Analysis 3	6
62458	Chemical Technology (2 sem)	3
	Elective*	6
62485	Advanced Chemistry Project (2 sem)†	5

STAGE 6

Spring Semester

62434	Industrial Chemistry, Safety and the Law	3
62456	Reaction Kinetics	3
62457	Surface Chemistry	3
62458	Chemical Technology (2 sem)	3
	Elective*	6
62485	Advanced Chemistry Project (2 sem)†	5

PART-TIME PROGRAMME

STAGE 1

Academic Requirements

Autumn Semester *Hours/Week*

62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
91378	Concepts in Biology P/T (2 sem)	3
	or	
62312	Geology 1 P/T (2 sem)	3
33170	Basic Science Mathematics	3
	or	
33175	Science Mathematics 1 P/T (2 sem)	2

Spring Semester

62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
91378	Concepts in Biology P/T (2 sem)	3
	or	
62312	Geology 1 P/T (2 sem)	3
31870	Introduction to Microcomputers	2
33175	Science Mathematics 1 P/T (2 sem)	2

STAGE 2

Academic Requirements

Autumn Semester

62422	Chemistry 2 P/T (2 sem)	3
63222	Physics 2 P/T (2 sem)	3
33175	Science Mathematics 1 P/T (2 sem)	2
	or	
33172	Science Mathematics 2	3
31871	Computing for Science	3

Spring Semester

62422	Chemistry 2 P/T (2 sem)	3
62423	Organic Chemistry 1	6
63222	Physics 2 P/T (2 sem)	3
33175	Science Mathematics 1 P/T (2 sem)	2

STAGE 3

Academic Requirements

Autumn Semester

62433	Chemical Analysis 1	4
62436	Chemical Spectroscopy	5
33172	Science Mathematics 2	3
	or	
33173	Science Mathematics 3	3

Spring Semester

62431	Structural Inorganic Chemistry	5
60031	Treatment of Scientific Data	3
63724	Materials Science 1	4

Industrial Requirements

62498	Industrial Training P/T**	3

STAGE 4

Academic Requirements

Autumn Semester

62432	Organic Chemistry 2	5
62441	Physical Chemistry 1	6
51368	Written and Oral Reporting	2

Spring Semester

62442	Electronics and Instrumentation	6
62443	Chemical Analysis 2	6

Industrial Requirements

62498	Industrial Training P/T**	3

STAGE 5

Academic Requirements

Autumn Semester

62453	Chemical Analysis 3	6
62458	Chemical Technology (2 sem)	3
51357	Oral Communication	2

Spring Semester

62434	Industrial Chemistry, Safety and the Law	3
62456	Reaction Kinetics	3
62457	Surface Chemistry	3
62458	Chemical Technology (2 sem)	3

Industrial Requirements

62498	Industrial Training P/T**	3

STAGE 6

Academic Requirements

Autumn Semester

21139	Business Organisation	2
	Elective*	6
62485	Advanced Chemistry Project (2 sem)†	5

Spring Semester		*Hours/Week*
	Elective*	6
62485	Advanced Chemistry Project (2 sem)†	5
Industrial Requirements		
62498	Industrial Training P/T**	3

*Electives

62454	Applied Inorganic Chemistry (A)	6
62455	Applied Organic Chemistry 1 (S)	6
62462	Environmental Chemistry (A)	6
62465	Extractive Metallurgy (S)	6
62467	Applied Organic Chemistry 2 (A)	6
62469	Co-ordination & Organometallic Chemistry (S)	6

** Industrial experience is an integral part of this course. The minimum period of relevant employment required is the equivalent of one years full-time employment. The Industrial Training Committee of the Chemistry Department provides guidance on this occupational requirement. The Industrial Training component in the sandwich programme must be undertaken after the completion of the third or fourth semester of academic work. It must be undertaken prior to commencement of the last semester of academic work.

† Students wishing to be considered for a pass award must complete a minimum of 134 semester hours, including two approved electives. To be eligible for consideration for an honours award students must complete a minimum of 134 hours formal coursework together with an advanced chemistry project of at least 10 hours.

Programme for Holders of the Associate Diploma in Chemical Technology

A special programme operates for students who have successfully completed the Associate Diploma in Chemical Technology of the Sydney Technical College and who are admitted into the Applied Chemistry degree course. The programme provides students with exemptions in a number of subjects and enables certificate holders to complete the Applied Chemistry degree programme part-time in five years. Students are admitted with advanced standing into Stage 2 of the course, and undertake the following programme:

STAGE 2

Academic Requirements		*Hours/Week*
Autumn Semester		
63212	Physics 1 P/T (2 sem)	3
63724	Materials Science 1	4
33170	Basic Science Mathematics	3
	or	
33175	Science Mathematics 1 P/T (2 sem)	2
Spring Semester		
63212	Physics 1 P/T (2 sem)	3
33175	Science Mathematics 1 P/T (2 sem)	2
62431	Structural Inorganic Chemistry	5
31870	Introduction to Microcomputers	2

STAGE 3

Academic Requirements		
Autumn Semester		
63222	Physics 2 P/T (2 sem)	3
33171	Science Mathematics 1 F/T	4
	or	
33172	Science Mathematics 2	3
31871	Computing for Science	3
Spring Semester		
63222	Physics 2 P/T (2 sem)	3
33172	Science Mathematics 2 (new)	3
	or	
33173	Science Mathematics 3 (new)	3
62436	Chemical Spectroscopy	5
Industrial Requirements		
62498	Industrial Training P/T	3

STAGES 4, 5 and 6
Identical to Applied Chemistry Degree Programme above with 60031 Treatment of Scientific Data instead of Written and Oral Reporting.

Exemptions Granted to Associate Diploma Holders:
Chemistry 1M
Chemistry 2M
Organic Chemistry 1
Chemical Analysis 1
Written and Oral Reporting
Geology 1
Introduction to Microcomputers
Chemical Technology 1

BACHELOR OF APPLIED SCIENCE (APPLIED GEOLOGY)

This degree course is designed for students seeking careers as professional geologists. The basic award for successful completion of the course is Bachelor of Applied Science, but the award of honours may be made to any student who has performed meritoriously in formal coursework and has submitted a project report of high standard.

The course programme comprises six stages of formal study plus at least one year of full-time (or its equivalent) relevant industrial experience. The formal study includes basic study of chemistry, physics, mathematics and geology, followed by general training in lithology and geological mapping, computer science, the treatment of scientific data, geodynamics and sedimentary, igneous and metamorphic geology. In the middle and later stages of the course, structural geology, exploration geophysics, remote sensing and tectonics are studied in association with exploration, resource, engineering and environmental geology, mining law, and financial aspects of the mineral industry. In these stages the student also studies a range of subjects in preparation for field and laboratory work in metalliferous and non-metalliferous exploration, and the geology of fossil fuels.

Industrial training is an essential part of the degree programme, and is normally completed in two six-month periods one after completion of Stage 2 and one on completion of Stage 4. The Department of Applied Geology maintains close liaison with potential employers and assists students to obtain appropriate positions. The student may make his or her own arrangements, but the Head of Department must be satisfied as to the suitability of the employment.

The common course patterns are:
- four years of full-time enrolment, including two six-month periods of industrial training:
- six years of part-time* attendance, while concurrently employed full-time in a relevant geological field:
- alternating periods of full-time study with similar periods of full-time relevant employment.

Full-time attendance involves 24 hours per week at the University; this enables a full Stage of the course to be completed in a semester.

Part-time attendance involves about 12 hours per week at the University; with this form of attendance the equivalent of a full Stage may be completed in one year. It is normal practice for employers to release part-time students for at least one half-day per week for attendance at classes. Students commonly attend the University for one half-day and three evenings per week, or for two half-days and two evenings per week.

*Industrial training can be achieved by the student being concurrently in suitable employment. The matter should be discussed with the Head, Department of Applied Geology.

FULL-TIME PROGRAMME

In these programmes, each Stage corresponds to one semester spent in full-time attendance at the University.

STAGE 1

Autumn Semester		*Hours/Week*
62310	Geology 1M F/T	6
62411	Chemistry 1 F/T	6
63211	Physics 1 F/T	6
	or	
91388	Concepts in Biology F/T	6
33170	Basic Science Mathematics	3
	or	
33171	Science Mathematics 1 F/T	4
31870	Introduction to Microcomputers	2

STAGE 2

Spring Semester		
62322	Geological Mapping	4
62325	Lithology	2
62332	Geodynamics	3
62421	Chemistry 2 F/T	6
63111	Physics LS F/T	6
	or	
63221	Physics 2 F/T	6
33171	Science Mathematics 1 F/T	4
	or	
33172	Science Mathematics 2	3

STAGE 3

Autumn Semester		
62396	Industrial Training 1	6

Spring Semester		
62330	Mineralogy and Petrology	8
62335	Sedimentary Geology	6
62336	Geochemistry	3
31871	Computing for Science	3
60031	Treatment of Scientific Data	3

STAGE 4

Autumn Semester		
62341	Technical Communication	4
62342	Structural Geology	6
62343	Economic Geology	4
62348	Resource Management	3
62355	Basin Analysis	3
62375	Exploration Geophysics	4

Spring Semester		
62397	Industrial Training 2	6

STAGE 5*

Autumn Semester		
62350	Engineering and Environmental Geology	6

		Hours/Week
62352	Advanced Petrology	4
62353	Fossil Fuels	4
62356	Exploration Geochemistry	3
62359	Project Seminar	3
62372	Advanced Structural Geology	4

STAGE 6*
Spring Semester

62351	Exploration and Mining Geology	4
62360	Field Project	9
62364	Tectonics	3
62367	Remote Sensing	4
One of:		
62371	Advanced Fossil Fuels	4
62374	Mineral Deposits	4
62377	Advanced Engineering Geology	4

PART-TIME PROGRAMME

STAGE 1
Academic Requirements

Autumn Semester		*Hours/Week*
62312	Geology 1 P/T (2 sem)	3
62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
33170	Basic Science Mathematics	3
	or	
33175	Science Mathematics 1 P/T (2 sem)	2

Spring Semester

62312	Geology 1 P/T (2 sem)	3
62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
33175	Science Mathematics 1 P/T (2 sem)	2
31870	Introduction to Microcomputers	2

STAGE 2
Academic Requirements
Autumn Semester

62325	Lithology	2
62422	Chemistry 2 P/T (2 sem)	3
63222	Physics 2 P/T (2 sem)	3
33175	Science Mathematics 1 P/T (2 sem) (new)	2
	or	
33172	Science Mathematics 2 (new)	3

Spring Semester

62322	Geological Mapping	4
62332	Geodynamics	3
62422	Chemistry 2 P/T (2 sem)	3
63222	Physics 2 P/T (2 sem)	3
33175	Science Mathematics 1 P/T (2 sem)	2

STAGE 3		*Hours/Week*
Academic Requirements		
Autumn Semester		
31871	Computing for Science	3
60031	Treatment of Scientific Data	3
62336	Geochemistry	3
Spring Semester		
62330	Mineralogy & Petrology	8
62335	Sedimentary Geology	6
Industrial Requirements		
62398	Industrial Training P/T	3

STAGE 4
Academic Requirements
Autumn Semester

62342	Structural Geology	6
62355	Basin Analysis	3
62375	Exploration Geophysics	4

Spring Semester

62341	Technical Communication	4
62343	Economic Geology	4
62348	Resource Management	3
Industrial Requirements		
62398	Industrial Training P/T	3

STAGE 5*
Academic Requirements
Autumn Semester

62353	Fossil Fuels	4
62352	Advanced Petrology	4
62372	Advanced Structural Geology	4

Spring Semester

62350	Engineering and Environmental Geology	6
62356	Exploration Geochemistry	3
62359	Project Seminar	3
Industrial Requirements		
62398	Industrial Training P/T	3

STAGE 6*
Academic Requirements
Autumn Semester

62351	Exploration and Mining Geology	4
62367	Remote Sensing	4
One of:		
62371	Advanced Fossil Fuels	4
62374	Mineral Deposits	4
62377	Advanced Engineering Geology	4

Spring Semester

62360	Field Project	9
62364	Tectonics	3
Industrial Requirements		
62398	Industrial Training P/T	3

* With permission of the Head of Department, other subjects may be substituted for particular subjects in Stage 5 or Stage 6, where this is appropriate.

BACHELOR OF APPLIED SCIENCE (APPLIED PHYSICS)

The development of modern technology and its application in a wide variety of industries has created a demand for graduates who have a scientific approach to applied problem solving, a deep understanding of the physical principles underlying systems, who are able to utilise modern equipment for measurement and control and are flexible and adaptable to changing job needs. Such graduates are Applied Physicists. Employment is found by Applied Physicists in a wide range of private industries and public authorities.

Both a pass course and an honours course are offered. The first four stages of both courses are identical, with all students enrolling into the pass course on commencing studies.

The first two stages of the course consist of the study of basic science subjects.

The course subjects emphasise measurement, and the use and design of instrumentation for measurement and control. There is thus an emphasis in the course on modern electronics and its applications.

Attendance Patterns

The pass course consists of six Stages which may be completed on a full-time (sandwich) or part-time basis. Under a sandwich pattern of attendance, involving 24 hours per week at the University, a full Stage may be completed in one semester. Allowing for a minimum period of one year of vocational experience, the course may be completed in four years. The normal attendance pattern is the sandwich pattern which is as follows:

Year 1
Stage 1 - (full-time at the University)
Stage 2 - (full-time at the University)

Year 2
Stage 3 - (full-time at the University)
Stage 4 - (full-time at the University)

Year 3
First Industrial Period of six months
Second Industrial Period of six months

Year 4
Stage 5 - (full-time at the University)
Stage 6 - (full-time at the University)

Part-time attendance involves 12 hours per week at the University, and with this form of attendance a full stage may be completed in one year. A student attending entirely on a part-time basis must satisfy the Head of School that he/she is employed in an area which is relevant to his/her academic programme. The student would require a minimum of six years to complete the course. Being in full-time employment, he/she would usually attend classes at the University for three evenings and one afternoon per week, assuming the commonly allowed day-release arrangements of one afternoon per week from employment.

Industrial training is regarded as an integral part of the course. All students, both full-time and part-time, must complete one year of relevant industrial experience.

SANDWICH PROGRAMME

Each Stage corresponds to one semester of full-time attendance at the University.

STAGE 1

Autumn Semester		*Hours/Week*
63211	Physics 1 F/T	6
62411	Chemistry 1 F/T	6
62311	Geology 1 F/T	6
	or	
91388	Concepts in Biology F/T	6
31870	Introduction to Microcomputers	2
33171	Science Mathematics 1 F/T	4

STAGE 2

Spring Semester		
63221	Physics 2 F/T	6
62421	Chemistry 2 F/T	6
63534	Introduction to Crystallography	2
63724	Materials Science 1	4
33172	Science Mathematics 2	3
33173	Science Mathematics 3	3

STAGE 3

Autumn Semester		
31871	Computing for Science	3
33221	Engineering Mathematics 2A	3
60031	Treatment of Scientific Data	3
63231	Physics 3	3
63235	Applied Optics	3
63238	Electrotechnology	3
63332	Electronics 1	6

STAGE 4

Spring Semester		
33330	Physical Mathematics	3
51358	Written and Oral Reporting	2
63243	Thermodynamics and Energy	3
63244	Vacuum and Thin Film Physics	3
63246	Computational Physics	4
63341	Quantum Physics 1	3

		Hours/Week
63348	Applied Mechanics	3
63352	Electronics 2	3
Autumn Semester		
63396	Industrial Training 1	6
Spring Semester		
63397	Industrial Training 2	6

STAGE 5

Autumn Semester		
63152	Materials Physics	3
63251	Nuclear Physics	3
63264	Solid State Physics	3
63254	X-ray Techniques	3
63255	Electron Microscopy Techniques	3
63358	Field Theory	3
63361	Microprocessors in Instrumentation	3
63281	Project A (2 sem)	3

STAGE 6

Spring Semester		
63263	Applied Thermodynamics	3
63252	Transducers and Devices	3
63342	Principles of Instrumentation	3
63351	Quantum Physics 2	3
63365	Physical Optics	3
63281	Project A (2 sem)	3
63282	Project B	3
	and	
.....	Elective	3

With the agreement of the Head of Department up to 6 semester hours may be varied to allow students to develop individual interests.

PART-TIME PROGRAMME

Each Stage corresponds to two semesters of part-time attendance at the University.

STAGE 1

		Hours/Week
Autumn Semester		
33175	Science Mathematics 1 P/T (2 sem)	2
62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
62312	Geology 1 P/T (2 sem)	3
	or	
91378	Concepts in Biology P/T (2 sem)	3
Spring Semester		
31870	Introduction to Microcomputers	2
33175	Science Mathematics 1 P/T (2 sem)	2

		Hours/Week
62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
62312	Geology 1 P/T (2 sem)	3
	or	
91378	Concepts in Biology P/T (2 sem)	3

STAGE 2

Autumn Semester		
33172	Science Mathematics 2	3
51368	Written and Oral Reporting	2
62422	Chemistry 2 P/T (2 sem)	3
63222	Physics 2 P/T (2 sem)	3
Spring Semester		
31871	Computing for Science	3
33173	Science Mathematics 3 (new)	3
62422	Chemistry 2 P/T (2 sem)	3
63222	Physics 2 P/T (2 sem)	3

STAGE 3

Autumn Semester		
33221	Engineering Mathematics 2A	3
63231	Physics 3	3
63332	Electronics 1	6
Spring Semester		
33330	Physical Mathematics	3
60031	Treatment of Scientific Data	3
63534	Introduction to Crystallography	2
63724	Materials Science 1	4

STAGE 4

Autumn Semester		
63235	Applied Optics	3
63238	Electrotechnology	3
63244	Vacuum and Thin Film Physics	3
63246	Computational Physics	4
Spring Semester		
63243	Thermodynamics and Energy	3
63341	Quantum Physics 1	3
63348	Applied Mechanics	3
63352	Electronics 2	3

STAGE 5

Autumn Semester		
63264	Solid State Physics	3
63254	X-ray Techniques	3
63255	Electron Microscopy Techniques	3
63361	Microprocessors in Instrumentation	3
63396	Industrial Training 1	6
Spring Semester		
63152	Materials Physics	3
63263	Applied Thermodynamics	3

		Hours/Week
63342	Principles of Instrumentation	3
63351	Quantum Physics 2	3
63397	Industrial Training 2	3

STAGE 6

Autumn Semester

63251	Nuclear Physics	3
63358	Field Theory	3
63281	Project A (2 sem)	3
.....	Elective	3

Spring Semester

63252	Transducers and Devices	3
63365	Physical Optics	3
63281	Project A (2 sem)	3
63282	Project (Pass) B	3

With the agreement of the Head of Department up to 6 semester hours may be varied to allow students to develop individual interests.

BACHELOR OF APPLIED SCIENCE (APPLIED PHYSICS) (HONOURS)

Introduction

Students doing the Applied Physics degree at UTS have the opportunity of undertaking an Honours degree after four semesters of study. An Honours degree is often undertaken by students who wish to demonstrate a higher level of academic ability. Many Honours students go on to Postgraduate studies and embark on a career in research.

Course

On commencing studies at UTS, all Applied Physics students enrol in the Pass degree. For the first four semesters all students undertake the same programme of study. Those students who perform well over this period may then transfer into the Honours programme. Such students then do either 2 years of full-time study or 3 years of part-time study to complete the degree. There is no difference in the total length of the Pass degree and the Honours degree; they are both 4 years in duration. The Honours degree however, involves higher assessment standards, more advanced academic work, an industrial project and a substantial final year research project.

Admission

Students are normally admitted to the course if they have achieved a WAM (weighted average mark) of 65 or better for subjects in stages 3 and 4 in the Applied Physics Degree Course.

Progress

Students admitted to the honours course are required to maintain a WAM of at least 65 in both the academic component and the industrial Honours project. Students who do not maintain this standard, or who do not wish to continue in the honours course, revert to the pass course.

Assessment of Honours

The overall honours mark at the end of the course is a weighted mark according to the following scheme:

Honours Research Project	40%
Honours Industrial Project	15%
Advanced subjects	30%
Subjects (above stage 4) which are taken in common with pass students	15%
	100%

The class of honours awarded is normally determined as follows:

Class 1	Honours mark of 80 or greater
Class 2, Division 1	Honours mark between 70 & 79
Class 2, Division 2	Honours mark between 60 & 69
Class 3	Honours mark between 50 & 59

FULL-TIME PROGRAMME

YEARS 1 TO 2

As for Stages 1 to 4 of the pass course.

YEAR 3

Autumn Semester		*Hours/Week*
63152	Materials Physics*	3
63358	Field Theory*	3
63361	Microprocessors in Instrumentation*	3
63395	Industrial Training (Honours)	6

Spring Semester

63263	Applied Thermodynamics*	3
63351	Quantum Physics 2*	3
63365	Physical Optics*	3
63397	Industrial Training 2	6

YEAR 4

Autumn Semester

63155	Communication Physics	3
63251	Nuclear Physics*	3
63264	Solid State Physics*	3
63271	Advanced X-ray Techniques	3
63272	Advanced Eelctron Microscopy Techniques	3
62385	Project (Honours) (2 sem)	10

Spring Semester		*Hours/Week*
63252	Transducers and Devices*	3
63273	Advanced Solid State Physics	3
63342	Principles of Instrumentation*	3
63382	Computer Modelling of Physical Systems	3
63285	Project (Honours) (2 sem)	10

Subjects marked * are taken in common with pass students.

With the agreement of the Head of Department, up to 6 semester hours may be varied to allow students to develop individual interests.

PART-TIME PROGRAMME

YEARS 1 T0 4
As for Stages 1 to 4 of the pass course.

YEAR 5

Autumn Semester		*Hours/Week*
63251	Nuclear Physics*	3
63258	Field Theory*	3
63361	Microprocessors in Instrumentation*	3
63395	Industrial Training (Honours)	6

Spring Semester		
63152	Materials Physics*	3
63245	Applied Thermodynamics*	3
63351	Quantum Physics 2*	3
63365	Physical Optics*	3
63397	Industrial Training 2	6

YEAR 6

Autumn Semester		
63155	Communication Physics	3
63264	Solid State Physics*	3
63271	Advanced X-ray Techniques	3
63272	Advanced Electron Microscopy Techniques	3

Spring Semester		
63252	Transducers and Devices*	3
63273	Advanced Solid State Physics	3
63342	Principles of Instrumentation*	3
63382	Computer Modelling of Physical Systems	3

YEAR 7

Autumn Semester		
63285	Project (Honours) (2 sem)	10

Spring Semester		
63285	Project (Honours) (2 sem)	10

Subjects marked * are taken in common with pass students.

With the agreement of the Head of Department, up to 6 semester hours may be varied to allow students to develop individual interests.

BACHELOR OF APPLIED SCIENCE (MATERIALS SCIENCE)

With the development of technology has come an increasing demand for new, more specialised and more reliable materials. Modern engineering and scientific enterprises continue to involve larger and more complex structures or devices. Factors such as the operational behaviour, relative costs and the aesthetic appeal of different materials become more and more stringently specified. It is from this background that Materials Science has emerged as a separate field of study out of the traditional disciplines of physics, chemistry, metallurgy and engineering.

Materials Science deals with the scientific principles governing the engineering properties of materials and the application of these properties in modern technology. Metals, ceramics and organic materials are treated in an integrated manner to establish the criteria for materials selection in relation to service conditions, materials compatibility and material durability.

Attendance Patterns

The course consists of six Stages which may be completed as follows:

1. *For Students Studying Full-Time*
   Three years of study are integrated with a 12-month period of employment in suitable industries.

2. *For Students Studying Part-Time*
   Six years of part-time study whilst employed in a relevant industry.

3. *A Combination of Full-Time and Part-Time Study*
   Students have the flexibility of choice and may complete portions of their course on a full-time or part-time basis.

All students enrolled in the Materials Science degree course are required to undertake one calendar year of full-time, or the part-time equivalent, industrial training of an approved nature. This industrial training is an integral and compulsory part of the degree programme. A programme of this type is called a Co-operative Education Programme or a Sandwich Programme.
Under a full-time pattern of attendance, involving 24 hours per week at the University, a full Stage may be completed in one semester. Allowing for a minimum period of one year of vocational experience, the course may be completed in four years.

Part-time attendance involves 12 hours per week at the University, and with this form of attendance a full stage may be completed in one year. Students attending entirely on a part-time basis must satisfy the Head of Department that they are employed in an area which is relevant to their academic programme. They would require a minimum of six years to complete the course. Part-time attendance normally requires attendance at the University on one afternoon and two to three evenings per week.

SANDWICH PROGRAMME

Each Stage corresponds to one semester of full-time attendance at the University.

STAGE 1

Autumn Semester		*Hours/Week*
62311	Geology 1 F/T	6
	or	
91388	Concepts in Biology F/T	6
62411	Chemistry 1 F/T*	6
63211	Physics 1 F/T*	6
31870	Introduction to Microcomputers	2
33170	Basic Science Mathematics	3
	or	
33171	Science Mathematics 1 F/T	4

STAGE 2

Spring Semester		
62421	Chemistry 2 F/T	6
63221	Physics 2 F/T	6
62191	Introductory Organic Chemistry	3
63534	Introduction to Crystallography	2
63724	Materials Science 1	4
33171	Science Mathematics 1 F/T	4
	or	
33172	Science Mathematics 2	3

STAGE 3

Autumn Semester		
51368	Written and Oral Reporting*	2
60031	Treatment of Scientific Data	3
62192	Thermodynamics	3
63532	Polymers 1	3
63533	Mechanical Properties of Materials	6
63535	Materials Science 2	4
33172	Science Mathematics 2	3
	or	
33173	Science Mathematics 3	3

STAGE 4

Spring Semester		
31871	Computing for Science	3
63541	Physical Metallurgy 1	4
63542	Polymers 2	4
63543	Materials Science 3	3
63544	Physical Metallurgy 2	4
63546	Ceramics 1	4
33173	Science Mathematics 3	3
	or	
21139	Business Organisation	2

Autumn Semester		
63596	Industrial Training 1	6
Spring Semester		
63597	Industrial Training 2	6

STAGE 5

Autumn Semester		
63359	Applied Physics (Materials)	4
63551	Physical Metallurgy 3	4
63556	Ceramics 2	4
63562	Polymers 3	4
63566	Ceramics 3	4
63858	Project (2 sem)	4

STAGE 6

Spring Semester		
62193	Corrosion Technology	4
62465	Extractive Metallurgy	6
63553	Materials Degradation	2
63563	Surface Properties of Materials	4
63567	Design and Materials Selection	2
63568	Composites	2
63858	Project (2 sem)	4

*Subject normally available both Autumn and Spring Semester.

PART-TIME PROGRAMME

Each Stage corresponds to two semesters of part-time attendance at the University.

STAGE 1

Academic Requirements		*Hours/Week*
Autumn Semester		
62312	Geology 1 P/T (2 sem)	3
	or	
91378	Concepts in Biology P/T (2 sem)	3
62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
33170	Basic Science Mathematics	3
	or	
33175	Science Mathematics 1 P/T (2 sem)	2

Spring Semester		
62312	Geology 1 P/T (2 sem)	3
	or	
91378	Concepts in Biology P/T (2 sem)	3
62412	Chemistry 1 P/T (2 sem)	3
63212	Physics 1 P/T (2 sem)	3
31870	Introduction to Microcomputers	2

		Hours/Week
33175	Science Mathematics 1 P/T (2 sem)	2

STAGE 2
Academic Requirements
Autumn Semester

62422	Chemistry 2 P/T (2 sem)	3
63222	Physics 2 P/T (2 sem)	3
63724	Materials Science 1	4
33175	Science Mathematics 1 P/T (2 sem)	2
	or	
33172	Science Mathematics 2	3

Spring Semester

62191	Introductory Organic Chemistry	3
62422	Chemistry 2 P/T (2 sem)	3
63222	Physics 2 P/T (2 sem)	3
63534	Introduction to Crystallography	2
33175	Science Mathematics 1 P/T (2 sem)	2

STAGE 3
Academic Requirements
Autumn Semester

51368	Written & Oral Reporting	2
62192	Thermodynamics	3
63532	Polymers 1	3
63535	Materials Science 2	4

Spring Semester

63541	Physical Metallurgy 1	4
63543	Materials Science 3	3
63546	Ceramics 1	4

Industrial Requirements

63598	Industrial Training P/T	3

STAGE 4
Academic Requirements
Autumn Semester

60031	Treatment of Scientific Data	3
63533	Mechanical Properties of Materials	6
33172	Science Mathematics 2	3
	or	
33173	Science Mathematics 3	3

Spring Semester

63542	Polymers 2	4
63544	Physical Metallurgy 2	4
31871	Computing for Science	3
33173	Science Mathematics 3	3
	or	
21139	Business Organisation	2

Industrial Requirements

63598	Industrial Training P/T	3

STAGE 5
Academic Requirements
Autumn Semester

		Hours/Week
63359	Applied Physics (Materials)	4
63551	Physical Metallurgy 3	6
63556	Ceramics 2	4

Spring Semester

62193	Corrosion Technology	4
62465	Extractive Metallurgy	6
63567	Design and Materials Selection	2

Industrial Requirements

63598	Industrial Training P/T	3

STAGE 6
Academic Requirements
Autumn Semester

63562	Polymers 3	4
63566	Ceramics 3	4
63858	Project (2 sem)*	4

Spring Semester

63563	Surface Properties of Materials	4
63553	Materials Degradation	2
63568	Compositess	2
63858	Project (2 sem)*	4

Industrial Requirements

63598	Industrial Training P/T	3

*Subject normally available both Autumn and Spring Semester

SYNOPSES

60031 TREATMENT OF SCIENTIFIC DATA

Three semester hours
Prerequisite: 33171 or 33175 Science Mathematics 1 (new), 31870 Introduction to Microcomputers

Errors: error calculations, error propagation. Presentation of data and graphical analysis. Population and frequency distributions. Sampling techniques. Least-squares. Applications of concepts to the physical sciences.

62178 ENGINEERING CHEMISTRY

Six semester hours (3s/hrs lectures, 1 s/hr tutorial, 2 s/hrs practical/workshops.)

This lecture series covers the following topics: mole concept, stoichiometry, structure of the atom, atomic spectra, periodic table, chemical bonding, electrochemistry and corrosion, gas laws, change of state, colloids, solution equilibria, applied organic chemistry and the structure of solids.

62191 INTRODUCTION ORGANIC CHEMISTRY
Three semester hours (lectures and practical)
Prerequisite: 62411 Chemistry 1 F/T or 62412 Chemistry 1 P/T
Corequisite: 62421 Chemistry 2 F/T or 62422 Chemistry 2 P/T

Structures, bonding and nomenclature of organic compounds. Functional groups. Preparation properties and reactions of: aliphatic hydrocarbons, alkyl halides, alcohols, ethers, amines, aldehydes, kentones, nitriles. acids and derivatives, benzene and derivatives. Qualititative analysis: IR and UV spectroscopy., chromatography. Structural and geometric isomerism. Examples of chain and condensation polymerisations. Consumption of plastics and natural polymers. Structures of some common polymers. Natural gas, oil and petroleum. The raw materials for plastics. Organic chemicals from wood and coal. Soaps, detergents, dyes etc.

62192 THERMODYNAMICS
Three semester hours Lectures and practical
Prerequisites: 63521 Materials Science 1, 33163 Science Mathematics 2 (Physical Science) or 33213 Ordinary Differential Equations, 62422 Chemistry 2 P/T or 62421 Chemistry 2 F/T

First Law of Thermodynamics, internal energy and enthalpy changes in chemical and physical reations. Entropy and the Second and Third Laws of Thermodynamics. Free energy and chemical equilibria. Phase equilibria. The thermodynamic properties of ideal and non-ideal solutions.

62193 CORROSION TECHNOLOGY
Four semester hours (2s/hrs lectures. 2 s/hrs practical)
Prerequisite: 63544 Physical Metallurgy 2

The course provides a detailed survey of the various forms of corrosion, and the use of appropriate anti-corrosion techniques are discussed in terms of modern theory and practice. Some attention is given to th economics of alternative anti-corrosion methods. Lectures are completmented by extensive practical work which emphasises the applied nature of the subject.

62310 GEOLOGY IM F/T
Six semster hours (2 s/hrs lectures, 4 s/hrs practical)
For students in the Applied Geology degree course. Equivalent to 62311 plus a one day field excursion in the Sydney region.

62311 GEOLOGY 1 F/T
Six semester hours (2 s/hrs lectures. 4 s/hrs practical)

The dynamic Earth: Earth materials: Earth structure and the evolution of the continents and oceans. Geological history. Geological structure of Australia. Resource and enviornmental geology. Two 1/2 day field excursions in the Sydney area.

62312 GEOLOGY 1 P/T
Three semester hours for two semesters

Equivalent to 62311.

62322 GEOLOGICAL MAPPING
Four semester hours 11/2 s/hrs lectures. 2 1/2 s/hrs practical)
Prerequisite: 62311 or 62312 Geology 1

Maps and aerial photographs: contours: stratigraphic principles and correlation: folds and faults: intepretation of geological maps: surveying and mapping techniques. Gelological framework of Australia. Six-day field camp.

62325 LITHOLOGY
Two semester hours (1 s/hr lecture, 1 s/hr practical)
Prerequisite: 62311 or 62312 Geology 1

Crystal symmetry and habit. Crystal growth types. Chemical classification of minerals: Ore mineral associations. Field classification and hand specimen description of igneous, sedimentary, metamorphoric and volcanic rocks. Includes origin and types of deposits. Practical includes hand specimen examination of common minerals and rocks.

62330 MINERALOGY AND PETROLOGY
Eight semester hours (3 s/hrs lectures, 5 s/hrs practical)
Prerequisite: 62325 Lithology

Crystal symmetry and Miller Indices. Optical theory. Use of the polarising microscope. Optical properties, chemistry and paragenesis of rock-forming minerals. Crystallisation paths of igneous minerals: occurrence, mineralogy and texture of igneous rocks; nature of magma and its cooling behaviour; magmatic differentiation; sources of magma - nature of crust and upper mantle; igneous rock associations. Types of metamorphism and textures of metamorphic rocks; chemical equilibria and metamorphic mineral reations; concept of metamorphic zones and facies; metamorphic rock association. Microscopic and megascopic description or rock types. Five-day field camp with 62335 Sedimentary Geology.

62332 GEODYNAMICS
Three semester hours (1 1/2 s/hrs lectures, 1 1/2 s/hrs practical)
Prerequisite: 62311 or 62312 Geology 1

Earth structure. Seismology. Earth magnetism. Gravity and isostasy. Radioactivity and geochronology. Internal heat and heat flow in the Earth. Crustal structure - oceanic and continental crust. Theory of sea-floor spreading. Continental drift and palaeomagnetism. Concept of plate tectonics. Features of divergent, transform and convergent plate margins.

62335 SEDIMENTARY GEOLOGY
Six semester hours (3 s/hrs lectures, 3 s/hrs practical)
Pre or Corequisite: 62330 Mineralogy and Petrology

Nature and origin of sedimentary materials and stratigraphic sequences including processes of weathering , transportation, deposition and diagenesis. Sedimentology of principal depositional environments; petrograhic and textural analysis of sediments; nature and identification of clay minerals; introduction to palaeontological technicques. Field work.

62336 GEOCHEMISTRY
Three semester hours (1 1/2 s/hrs lectures, 1 1/2 s/hrs practical)
Corequisite: 62330 Mineralogy and Petrology

Abundance and distribution of elements and their geochemical classification. Crystallochemical concepts and structure and classification of common minerals. Fundamentals of chemical thermodynamics and application of thermodynamics to geological systems. Isotopy. Aqueous geochemistry and its significance in chemical weathering chemical sedimentation, diagenesis and metamorphism.

62341 TECHNICAL COMMUNICATION
Four semester hours (2 s/hrs lectures, 2 s/hr tutorial)
Prerequisites: 62330 Mineralogy and Petrology, 62335 Sedimentary Geology

The nature of technical communication, geological report writing and presentation. Visual Communication: charts, graphs, line drawings, maps, statistics. Legal problems of technical communication: contracts, copyright. House style, standard abbreviations and terminology. Editing, preparation and submission of technical manuscipts for publication and/or printing. Oral presentation of technical reports, participation in symposia. Journal and library research.

62342 STRUCTURAL GEOLOGY
Six semester hours (2 1/2 s/hrs lectures, 3 1/2 s/hrs practical)
Prerequisites: 62330 Mineralogy and Petrology, 62335 Sedimentary Geology

Stress, strain, rheological concepts, and problems pertaining to rock deformation: classification, recognition and formation of fracture systems in brittle and transitional environments;: classification, recognition and formation of structures in ductil environments: collection and analysis of structural data in mine, field and laboratory data presentation: mineralisation in the structural environment field work.

62343 ECONOMIC GEOLOGY
Prerequisites: 62330 Mineralogy and Petrology, 62335 Sedimentary Geology

Introduction to the nature of ore bodies: genesis. classification and laboratory methods of investigating such deposits. Field guides to mineralisation: field investigation of mineralisation.

62348 RESOURCE MANAGEMENT
Three semester hours (1 s/hr lecture, 2 s/hrs practical)
Prerequisite: 62325 Lithology

Determination of reserves and resources on a gloval scale. Definition of reserve categories in use in Australia. The structure and financing of mining companies including financial evaluation techniques using discounted cash flows. Stock exchange operation. Metal marketing and cartels. The New South Wales Mining Law: comparison with law in other States. Government policies with respect to the mining industry and the effects of political decisions on mining operations. Ethics in the mining industry and the gelogical profession.

62350 ENGINEERING AND ENVIRONMENTAL GEOLOGY
Six semester hours (lecture and practical plus four day field excursion)
Pre or Corequisites: 62342 Structural Geology, 62375 Exploration Geophysics, 62348 Resource Management

Environmental ethics. Fundamental concepts in environmental planning. Geologic hazard recognition and planning. Australian environmental legislation. Environmental impact statement preparation. Environmental aspects of geological resource utilisation. Mine rehabilitation. Soil classification. Rheological properties or rocks and soils. Soil compaction for engineering

purposes. Engineering rock mass concepts and classification. Engineering testing of rock and soil materials. Groundwater geology, hydrology, exploration and development. Soil and rock slope stability. Geomorphology and terrain analysis. Coastal and river engineering. Engineering geology in dam reservoir, road and railway planning and design.

62351 EXPLORATION AND MINING GEOLOGY
Four semester hours (1 1/2 s/hrs lectures, 2 1/2 s/hrs practical)
Prerequisites: 62342 Structural Geology, 62343 Economic Geology

Principles of project initiation and continuation; functions of the controlling on-site geologist; exploration programmes and budgeting; critical path analysis. Prospect analysis using discounted cash flow methods. Relation of exploration programmes to geological models. Prospecting methods and follow-up techniques. Drilling: commonly used methods; logging of drill products; interpretation of results. Drill-sections, level plans, grade and recovery predictions, reserves estimation. Mineral processing.

62352 ADVANCED PETROLOGY
Four semester hours (1 1/2 s/hrs lectures, 2 1/2 s/hrs practical)
Pre or Corequisite: 62372 Advanced Structural Geology

Mineral stability fields in the crust. Constitution of the crust and upper mantle. Origin of basaltic magmas. Partial metling and fractional crystallisation hypotheses. The "pyrolite" model. Orogenic igneous rock associations. Petrological evolution of the crust and upper mantle. Experimental metamorphic reactions. Metamorphic facies. Mineral parageneses in metamorphic rocks. Ecologites. Metamorphic belts. Metamorphism and crustal evolution. Field work.

62353 FOSSIL FUELS
Four semester hours (1 1/2 s/hrs lectures, 2 1/2 s/hrs practical)
Pre or Corequisites: 62335 Sedimentary Geology, 62355 Basin Analysis

World energy market. Geology of fossil fuel deposits including coal and associated strata, petroleum, natural gas and synfuels derived from oil shale, tar sands and other petroliferous sediments. Introduction to methods of resource size estimation. Field excursions.

62355 BASIN ANALYSIS
Three semester hours (1 1/2 s/hrs lectures, 2 1/2 s/hrs practical)
Pre or Corequisites: 62342 Structural Geology, 62375 Exploration Geophysics

Techniques of stratigraphic dating and correlation: interpretation of modern and ancient depositional environments: palaeocurrent analysis: provenance, dispersal and diagenesis: relations between basin structure, tectonism and sedimentation; field work.

62356 EXPLORATION GEOCHEMISTRY
Three semester hours (1 s/hr lectures, 2 s/hrs practical)
Pre or Corequisites: 62343 Structural Geology, 62343 Economic Geology

Introduction to geochemical exploration. Stream, soil, rock, plant sampling. Testing methods. Sampling theory. Sample security. Geochemical maps.

62359 PROJECT SEMINAR
Three semester hours

In preparation for the Field Project (62360), students are assigned seminar topics which include a literature search on an area of interest, background reading on relevant theoretical topics, and practial or field excercises designed to develop skills applicable to the particular Field Project proposed.

62360 FIELD PROJECT
Nine semester hours

This is an assignment to be carried out under supervision of a specified member of staff. The assignment combines a literature search, field mapping and/or sampling, and a short laboratory investigation. Assessment is based on a formal typed report submitted to the supervisor before the last week of the semester.

62364 TECTONICS
Three semester hours (1 1/2 s/hrs lectures, 1 1/2 s/hrs) practical)
Prerequisites: 62322 Geodynamics, 62352 Advanced Petrology

Origin and evolution of the Earth's continental crust. Change in tectonic regime and time. Large-scale geologic cycles, major Precambrian-Cambrian boundary divisions. Archean geology and tectonics. Granite/greenstone and high-grade metamorphic terrains. Proterozoic crustal associations, special characteristics and tectonics. Reactivated basement models. Plate tectonics and crustal evolution. Plate tectonics and orogeny. Wilson

cycle. Collision and activation orogenics. Tectonics of present day plate margins. Case studies of the Red Sea/ African Rift System (divergent). Gulf of California/San Andreas (transform) and Himalayan (convergent) boundaries. Detailed study of sea-floor spreading in the Mesozoic/Cenozoic. Concept of tectonostratigraphic terranes. Tectonic evolution of Australia.

62367 REMOTE SENSING
Four semester hours (1 1/2 s/hrs lectures, 2 1/2 s/hrs practical)
Pre or Corequisites: 62342 Structural Geology, 62343 Economic Geology

Utilisation of differing parts of the elctromagnetic spectrum in remote sensing. Distant and near remote sensing; radar and infrared imagery; traditional black and white, and colour air-photography; multispectral photography and scanning; satellite imagery. Emphasis will be on geological applications of remote sensing in reconnaissance mapping., geotectonics, and mineral exploration. Practical work will predominantly involve principles of air-photo interpretation.

62371 ADVANCED FOSSIL FUELS
Four semester hours (1 1/2 s/hrs lectures, 2 1/2 s//hrs practical)
Prerequisite: 62353 Fossil Fuels

Exploration and production techniques for coal and petroleum deposits. Reservoir engineering and development of petroleum fields. Assessment of coal and gas reserves. Geological factors in coal mine development and operation. Economic assessment and risk analysis.

62372 ADVANCED STRUCTURAL GEOLOGY
Four semester hours
Prerequisite: 62343 Economic Geology
Pre or Corequisite: 62352 Advanced Petrology

Elastic, plastic and viscous behaviour in relation to the deformation of mono- and poly-minerallic aggregates; microfabric studies - grain boundary relationships, preferred orientation and the application of the U-stage; theoretical advances in the formation of folds, foliations and lineations; metamorphism and deformation in space and time - progressive deformation relationships on hand-speciment, mine and regional scales; metamorphism, deformation and remobilisation or ore deposits; tectonics and ore distribution; the evolution with geologic time of structure, tectonics and ore deposits. Field work.

62374 MINERAL DEPOSITS
Four semester hours
Prerequisites: 62342 Structural Geology, 62343 Economic Geology

Case studies of classical metallic and non-metallic mineral deposits; their genesis in the light of current theories of ore formation; evidence adduced from field and laboratory studies. Classification of mineral deposits relative to environment and method of formation.

62375 EXPLORATION GEOPHYSICS
Four semester hours (1 1/2 s/hrs lectures, 2 1/2 s/hrs practical)
Prerequisites: 63223 Geodynamics, 31799 Computing 1

Introduction to common methods of air and ground geophysics; theory, technique and equipment; interpretation principles; limitations, particularly in differing parts of Australia. Applications of selected techniques in regional exploration, ground follow-up and target-detailing. Down-hole methods of geophysics; geophysical logging. Integration of geophysics with other exploration techniques within on-going exploration programmes.

62377 ADVANCED ENGINEERING GEOLOGY
Four semester hours (1 1/2 s/hrs lectures, 2 1/2 s/hrs practical)
Prerequisite: 62350 Engineering and Environmental Geology

Quantification of geologic data for engineering purposes; stress and deformation in soil and rock masses, especially near surface excavations and underground openings; special techniques for field and laboratory investigations; evaluation and development of groundwater resources, probabilistic analysis of soil and rock slope stability.

62378 MINERAL SCIENCE PROJECT
Five semester hours

This project is a field and/or laboratory study on a topic selected by the Head of School. It should include literature review pertinent to the topic, appropriate methods of scientific investigations and where possible relate to the needs of and facilities available to the invididual student.

62379 MINERAL SCIENCE PROJECT - Report and Seminar
Two semester hours

A report and seminar prepared by the student on the mineral science project.

62388 GEOLOGY FOR ENGINEERS
Three semester hours

Nature of minerals; origin and classification of igneous, sedimentary and metamorphic rocks; rock weathering processes; river landscapes, marine landscapes; rock slope stability; uses of rock in construction; structural features of rocks; geological mapping techniques; introduction to rock mechanics.

62390 THESIS (Applied Geology) F/T

62391 THESIS (Applied Geology) P/T & EXT

62396 INDUSTRIAL TRAINING 1 (Applied Geology)
Prerequisites: 62322 Geological Mapping, 62325 Lithology

The first period of at least six months full-time relevant industrial employment is necessary to satisfy this subject. The employment must have the approval of the Head Department of Applied Geology.

62397 INDUSTRIAL TRAINING 2 (Applied Geology)
Prerequisite: Stage 4, Applied Geology Course

62398 INDUSTRIAL TRAINING P/T (Applied Geology)

62411 CHEMISTRY 1 F/T

62412 CHEMISTRY 1 P/T
Six semester hours (62412 extends over 2 semesters at 3 s/hrs/week. 2 s/hrs lectures. 1 s/hr tutorial, 3 s/hrs practical)
Prerequisite: HSC Science (any course) or equivalent

Revision of basic concepts. Atomic structure. Periodic table. Bonding. Stoichiometry. Heat changes in chemical reactions. Structure of matter. Changes of state. Redox reactions.

62414 CHEMISTRY IM F/T
Six semester hours
Assumed knowledge: Core of HSC Chemistry 2U course or equivalent

Preparation for practical work, atomic structure, periodic tables, chemical bonding. Redox reactions, chemical energetics, properties of matter.

62416 CHEMISTRY 1 F/T (Life Sciences)
See 62417

62417 CHEMISTRY 1 P/T (Life Sciences)
Six semester hours (62417 extends over 2 semesters at 3 s/hrs/week, 2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical)
Prerequisite: HSC Science (any course) or equivalent

Introduction to basic concepts. Atomic structure. Periodic table. Bonding. Heat changes. Structure of matter, Solutions.

62421 CHEMISTRY 2 F/T

62422 CHEMISTRY 2 P/T
Six semester hours (62422 extends over 2 semesters at 3 s/hrs/week. 2 s/hrs lectures. 1 s/hr tutorial. 3 s/hrs practical)
Prerequisites: 62411 Chemistry 1 F/T or 62412 Chemistry 1 P/T

Chemical equilibirum. Acid-base theory. Reaction kinetics. Electrochemistry. Manufacture of chemicals. Introduction to organic chemistry.

62423 ORGANIC CHEMISTRY 1
Six semester hours (3 s/hrs lectures/tutorial, 3 s/hrs practical)

Introduction to organic chemistry. Nomenclature, functional groups, reaction mechanisms, stereochemistry, chemical and instrumental analysis.

62424 CHEMISTRY 2 M F/T
Six semester hours
Prerequisite: 62414 Chemistry 1 M F/T or equivalent

Chemical kinetics, chemical equilibrium, enthalpy and entropy, acid-base theory, complex ions, electrochemistry, manufacture of chemicals.

62426 CHEMISTRY 2 (Life Sciences)
Six semester hours (3 s/hrs lectures, 3 s/hrs practical)
Prerequisite: 62416 Chemistry 1 F/T Life Sciences or 62417 Chemistry 1 P/T Life Sciences

Chemical equilibrium and solubility. Reaction kinetics. Introduction to organic chemistry. Functional groups, reaction mechanism and steorchemistry.

62431 STRUCTURAL INORGANIC CHEMISTRY
Five semester hours (2 s/hrs lectures, 3 s/hrs practical)
Prerequisite: 62421 Chemistry 2 F/T or 62422 Chemistry 2 P/T or 62424 Chemistry 2 M

Chemical bonding and molecular structure. Introduction to transition metal chemistry. Co-ordination complexes and co-ordinate bonds. Introduction to basic concepts in solid state structural chemistry.

62432 ORGANIC CHEMISTRY 2
Five semester hours (2 s/hrs lectures/tutorials, 3 s/hrs practical)
Prerequisites: 62423 Organic Chemistry 1, 62436 Chemical Spectroscopy plus all Stage 1 subjects

Structural determinations. Aromatic syntheses. Polynuclear aromatic hydrocarbons. Carbanion reactions. Carbohydrates. Hetrocyclic chemistry.

62433 CHEMICAL ANALYSIS 1
Four semester hours (1 s/hr lecture, 3 s/hrs practical)
Prerequisite: 62421 Chemistry 2 F/T or 62424 Chemistry 2M

An introduction to the theory and practice of qualitative and gravimetric analysis in organic chemistry. Classical methods of qualitative separation, identifying reactions of metal ions. Spot tests. Gravimetric separation methods. Theory of errors. Sampling methods.

62434 INDUSTRIAL CHEMISTRY, SAFETY AND THE LAW
Three semester hours (3 s/hrs lectures)
Corequisite: 62441 Physical Chemistry 1
Prerequisite: Work Experience

Principles of the processes used in industry. Efficiency of production, consumption of raw materials and energy; industrial fuels and water. Materials used.

62436 CHEMICAL SPECTROSCOPY
Five semester hours (2 s/hrs lectures/tutorials, 3 s/hrs practical)
Prerequisites: 62421 Chemistry 2 F/T or 62424 Chemistry 2M and 62423 Organic Chemistry 1

This subject is an introduction to the theory and applications of spectroscopy, including electronic, infrared, n.m.r. and mass spectroscopy.

62441 PHYSICAL CHEMISTRY 1
Six semester hours (2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical)
Prerequisites: 33172 Science Mathematics 2 and 62436 Chemical Spectroscopy

This subject provides a firm foundation in the principles and applications of thermodynamics, and a comprehensive course in basic electrochemistry treated substantially from the kinetic viewpoint.

62442 ELECTRONICS AND INSTRUMENTATION
Six semester hours (2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical)
Prerequisites: 63221 Physics 2, Stage 2 Chemistry subjects and all Stage 1 subjects

Electronics: components, relays, meters, transistors, integrated circuits. Digital electronics, counting circuits, pulse circuits, light detection devices.
Instruments: measuring instruments, op-amp polarographs, spectrometers.

62443 CHEMICAL ANALYSIS 2
Six semester hours (2 s/hrs lectures, 4 s/hrs practical)
Prerequisites: 62433 Chemical Analysis 1, 62431 Structural Inorganic Chemistry and all Stage 1 subjects

A lecture series with associated practical work on separation techniques and volumetric procedures used in analytical chemistry.

62453 CHEMICAL ANALYSIS 3
Six Semester hours (2 s/hrs lectures, 4 s/hrs practical)
Prerequisites: 62443. Chemical Analysis 2, 62441 Physical Chemistry 1 and all Stages 1 and 2 subjects

Spectroanalytical chemistry. X-ray fluorescence analysis. Electroanalytical chemistry. Radiochemistry.

62454 APPLIED INORGANIC CHEMISTRY
Six semester hours (2 s/hrs lectures, 4 s/hrs practical)
Prerequisites: All Stages 1, 2 and 3 subjects

Ligands and their industrial applications. Crystal field theory and mineralogical applications. Biological applications of co-ordination chemistry. Concepts in solid state structural chemistry. Technological applications of inorganic solids.

62455 APPLIED ORGANIC CHEMISTRY 1
Six semester hours (3 s/hrs lectures/tutorials, 3 s/hrs practical)
Prerequisites: All States 1, 2 and 3 subjects and 62432 Organic Chemistry 2

The chemistry of natural and synthetic polymers. Polymerisation processes, mechanisms and kinetics. Molecular weight determinations. The properties of polymers in relation to structure and molecular weight.

62456 REACTION KINETICS
Three semester hours (1 s/hr lecture, 2 s/hrs practical)
Prerequisites: 62441 Physical Chemistry 1, 62435 Treatment of Chemical Data or 60031 Treatment of Scientific Data, and all Stages 1, 2 and 3 subjects

Kinetics: Rate Laws, Reaction mechanism, rate theory.

62457 SURFACE CHEMISTRY
Three semester hours (1 s/hr lecture, 2 s/hrs practical)
Prerequisites: 62441 Physical Chemistry 1, 62435 Treatment of Chemical Data or 60031 Treatment of Scientific Data, and all Stages 1, 2 and 3 subjects

Interfacial phenomena, surface active agents, catalysis, rheology.

62458 CHEMICAL TECHNOLOGY (2 sem)
Six semester hours (3 s/hrs for two semesters)
Prerequisites: All Stage 3 Chemistry subjects and all Stages 1 and 2 subjects

Practical and theoretical treatment of automatic control. Development of differential equations for the process. Control problems solved using the analogue computer. Unit operations of fluid flow, and heat transfer treatment.

62462 ENVIRONMENTAL CHEMISTRY
Six semester hours (2 s/hrs letures, 4 s/hrs practical)
Prerequisites: All Stages 1, 2 and 3 subjects

The chemical nature and control of natural and polluted systems in the atmosphere and hydrosphere. The use of modern analytical techniques in study of such systems.

62465 EXTRACTIVE METALLURGY
Six semester hours (3 s/hrs lectures, 3 s/hrs practical)
Prerequisites: 62441 Physical Chemistry 1 plus all Stages 1, 2 and 3 subjects

Occurrence of minerals. Comminution and the theory of time particles. Extractive metallurgy including physical separation methods, flotation, hydrometallurgy and pyrometallurgy.

62467 APPLIED ORGANIC CHEMISTRY 2
Six semester hours (3 shrs lectures, 3 s/hrs practical)
Prerequisites: 62432 Organic Chemistry 2 and all Stages 1, 2 and 3 subjects

Selected advanced topics in organic chemistry including organic synthesis, photochemistry, natural products and instrumental methods.

62468 CORROSION SCIENCE
Six semester hours
Prerequisites: 62441 Physical Chemistry 1 plus all Stages 1, 2 and 3 subjects

The course provides a detailed survey of the various forms of corrosion, and the use of appropriate anti-corrosion techniques are discussed in terms of modern theory and practice. Some attention is given to the economics of alternative anti-corrosion methods. Lectures are complemented by extensive practical work which emphasises the applied nature of the subject.

62469 CO-ORDINATION AND ORGANOMETALLIC CHEMISTRY
Six semester hours

Spectral and magnetic properties of co-ordinating compounds. Structural chemistry including single crystal x-ray diffraction. Applications of thermodynamics and kinetics to inorganic chemistry. Organometallic Chemistry: theory and industrial applications. Co-ordination chemistry and catalysis.

62480 ADVANCED CHEMISTRY PROJECT (1 Semester)
Ten semester hours
Prerequisites: All Stages 1-4 subjects

Students may choose a topic from a wide range, on which to carry out work of an individual, investigative nature.

62485 ADVANCED CHEMISTRY PROJECT (2 Semesters)
Ten semester hours (5 s/hrs over 2 semesters)
Prerequisites: All Stages 1-4 subjects

Students may choose a topic from a wide range, on which to carry out work of an individual, investigative nature.

62490 THESIS (Applied Chemistry) F/T

62491 THESIS (Applied Chemistry) F/T & EXT

62496 INDUSTRIAL TRAINING 1 (Applied Chemistry)
First six months full-time

62497 INDUSTRIAL TRAINING 2 (Applied Chemistry)
Second six months full-time.

62498 INDUSTRIAL TRAINING P/T (Applied Chemistry)

63111 PHYSICS 1 (Life Sciences)
Six semester hours

General introduction to mechanics, wave motion, optics, thermal physics, properties of matter and modern physics.

63113 ENGINEERING PHYSICS 1 (Electrical)
Six semester hours
Corequisite: 33120 Engineering Mathematics 1.

This is a foundation Physics subject for Electrical Engineering students. It covers the fundamentals of dynamics and statics, fluid mechanics, and thermal physics. Students are introduced to the basic techniques of measurement.

63116 PHYSICS FOR ELECTRONICS
Six semester hours (2 1/2 s/hrs lectures, 1 s/hr tutorial, 2 1/2 s/hrs practical)

This is a foundation course for the sub-major in Electronics. It covers basic mechanics, wave motion and optics: electrostatics, electromagnetism and circuit analysis. An option, recommended in special cases only, is to replace the wave motion and optics with further mechanics including rotational motion.

63117 ENGINEERING PHYSICS (Mechanical)
Three semester hours

This is a foundation Physics course for Mechanical Engineering students. It covers the fundamentals of thermal physics, wave motion including sound and light, and electricity and magnetism.

63123 ENGINEERING PHYSICS 2 (Electrical)
Three semester hours
Prerequisites: 33120 Engineering Mathematics 1, 63113 Engineering Physics 1 (Electrical)

This is a foundation Physics subject for Electrical Engineering students. It covers the fundamentals of waves and optics, atomic and nuclear physics, and includes an introduction to magnetism.

63127 ELECTRICAL ENGINEERING 1 (Mechanical)
Three semester hours
Prerequisites: 63117 Engineering Physics (Mechanical), 33121 Engineering Mathematics 1

This subject covers the basic theory of electricity and magnetism and provides an introduction to the theoretical and practical aspects of electrical machines. The syllabus includes DC circuits transients, AC circuits, magnetic fields, electromagnetic induction, magnetic materials, magnetic circuits, DC machines, multiphase circuits, transformers, induction motors and synchronous machines.

63131 ENGINEERING PHYSICS (Civil)
Six semester hours
Corequisites: 33120 Engineering Mathematics 1, 43511 Statics

This is a foundation Physics subject for Civil Engineering students. It provides an understanding of fundamental concepts in dynamics, electro-magnetism, optics and thermal properties of matter. Students are introduced to the basic techniques of measurement.

63133 ENGINEERING PHYSICS 3 (Electrical)
Three semester hours
Prerequisites: 63123 Engineering Physics 2 (Electrical), 63734 Materials Technology (recommended).

Dielectric materials: fundamentals; classification of dielectrics; practical applications; relationship between atomic and bulk dielectric properties; dielectric breakdown.

Magnetic materials: classification of materials by magnetic properties; bulk magnetic properties and their measurement; magnetic materials for practical applications. Conduction modes in metals, dielectrics and semiconductors. Superconductivity (briefly).

63152 MATERIALS PHYSICS
Three semester hours (1 1/4 s/hrs lectures, 1 3/4 s/hrs practical)
Prerequisite: 63196 Electrotechnology

Dielectric properties: atomic theory, polarising ability, relaxation, ferroelectrics, piezoelectronics, breakdown. Magnetic properties: moments in atoms, ions, metals, ferrites and garnets, ferromagnetism. B-H loop, anisotropy, domains. Superconductivity: characteristics, flux trapping, type I and II applications.

63153 ENERGY TECHNOLOGY
Three semester hours (1 s/hr lecture, 1 s/hr seminar/ tutorial, 1 s/hr practical
Prerequisite: 63331 Physics 3 or equivalent

The physics of modern energy technology: energy sources, conversion, transportation, storage: new hydrocarbon fuel technology: electricity generation from nuclear fission, nuclear fusion, solar, wind and geothermal power; other energy utilisation systems. The subject includes an excursion to the AAEC Research Establishment at Lucas Heights.

63154 ELECTRICAL POWER GENERATION
Three smester hours
Prerequisite: 63113 Engineering Physics 1 (Electrical)

This is a basic course on energy and power for electrical engineering students. It covers the laws of thermodynamics: T-S diagrams: different thermodynamic cycles including the Otto. Diesel and steam engines; refrigeration cycles, thermal generation technology; nuclear reactors; nuclear fusion; M.H.D.: solar energy: alternative energy including wind, hydro, waves, tidal and geothermal: the distribution and storage of energy including pumped storage and batteries: the efficient use of energy: pollution: the economics, politics and planning of energy production and use.

63155 COMMUNICATION PHYSICS
Three semester hours

Basic aspects of electromagnetic wave propagation and attentuation in specific media. Real boundary problems, distributed source and multiwavelength effects: involving interference, diffraction, reflection, and image formation and processing. Waveguides and optical fibres. Sources and detectors of radiation. Electro-optic, acousto-optic and integrated optoelectronics.

63172 ELECTRICITY AND MAGNETISM
Three semester hours
Prerequiste: 63211 Physics 1

Introduction to electrostatics, electromagnetism and circuit analysis.

63173 PHYSICAL PROPERTIES
Three semester hours
Prerequiste: 63211 Physics 1

Properties of matter, geometric and physical optics and gravitation.

63175 THERMODYNAMICS
Two semester hours

Temperature scales. The First Law of Thermodynamics and various thermodynamic processes for solids, liquids and gases. The Second Law, entropy, and applications to heat engines. Thermodynamic functions and Maxwell's relations. Applications. e.g. specific heats, Joule-Kelvin effect, changes of phase.

63176 VACUUM TECHNOLOGY
Three semester hours

This course is an introduction to the practical aspects of scientific measurements and industrial processes requiring either low pressure or low temperature including: properties of substances under these conditions: untra-high vacuum techniques; leak testing: thin films; handling of liquified gases.

63185 INTRODUCTION TO QUANTUM PHYSICS
Two semester hours

Brief historical introduction, the Schroedinger equation. Time independent solutions for harmonic oscillator, infinte square well, hydrogen atom. Angular momentum. Interpretation of solutions.

63189 PHYSICS OF THE SOLID STATE
Three semester hours

Selection of topics from the subject 63354.

63190 ELECTRON MICROSCOPY
Two semester hours

Electron optics. Transmission F.M. and Scanning E.M.: image formation and contrast mechanisms. Microprobe analysis.

63197 ELECTROMAGNETIC FIELDS
Two semester hours
Corequisites: 63196 Electrotechnology, 33319 Advanced Calculus, 33213 Ordinary Differential Equations

Basic electromagnetic theory: Maxwell's equations; plane wave solutions in vacuum, dielectrics and conductors; boundary-conditions; reflection with normal incidence.

63211 PHYSICS 1 F/T
Six semester hours (3 1/2 s/hrs lectures/tutorials, 2 1/2 s/hrs practical)
Corequisites: 33170 Basic Science Mathematics or 33171 Science Mathematics 1 F/T or 33175 Science Mathematics 1 P/T (2 sem)

Introduction to the fundamental laws of mechanics, thermal physics, wave motion and optics.

63212 PHYSICS 1 P/T
Three semester hours for two semesters

Equivalent to 63211

63221 PHYSICS 2 F/T
Six semester hours (2 1/2 s/hrs lectures, 1 s/hr tutorial, 2 1/2 s/hrs practical)
Prerequisites: 63211 or 63212 Physics 1
Corequisites: 33171 or 33175 Science Mathematics 1

Introduction to electrostatics, electromagnetism and circuit analysis, properties of matter and optics. For Chemistry and Geology students; atomic and nuclear physics instead of gravitation and additional optics.

63222 PHYSICS 2 P/T
Three semester hours (2 1/2 s/hrs lectures/tutorial, 1/2 s/hr practical)
Prerequisites: 63221 or 63222 Physics 2, 33172 Science Mathematics 2
Corequisite: 33173 Science Mathematics 3

Introduction to quantisation. Matter waves. Bohr's theory of hydrogen atom. Spin. Multi-election atoms. Relativity. Introduction to statistical physics: Boltzmann's distribution.

63235 APPLIED OPTICS
Three semester hours (1 1/2 s/hrs lectures, 1 1/2 s/hrs tutorial/practical)
Prerequisite: 63221 or 63222 Physics 2
Corequisites: 33172 Sicence Mathematics 2, 33173 Science Mathematics 3

Polarisation; refraction at a plane and curved surfaces; thin lenses, thick lenses; colour and dispersion of light; the effects of stops; photometry; lens aberrations and lens design; intensification and enhancement; absorption, scattering and spectroscopy.

63238 ELECTROTECHNOLOGY
Three semester hours (1 s/hr lecture, 2 s/hrs tutorial/practical)
Prerequisite: 63221 or 63222 Physics 2
Corequisites: 33172 Science Mathmeatics 2, 33173 Science Mathematics 3

Basic electrostatics, magnetism and electromagnetism. Magnetic materials. Integral form of Maxwell's equations. Alternating currents using complex impedence. Electrical measurements and machinery, transformers, three-phase. AC/DC generators and motors.

63243 THERMODYNAMICS AND ENERGY
Three semester hours (2 1/2 s/hrs lecture/tutorial, 1/2 s/hr practical)
Prerequisite: 63221 or 63222 Physics 2
Corequisite: 63231 Physics 3

Applications of basic ideas of thermodynamics to the analysis of power generation, refrigeration, heat pumps. Methods of power production: hydrocarbons, alternative energy, energy storage and transportation, solar energy. Temperature measurement; thermocouple, optical pyrometer, resistance thermometry.

63244 VACUUM AND THIN FILM PHYSICS
Three semester hours (1 s/hr lecture, 2 s/hrs practical)
Prerequisite: 63231 Physics 3

Vacuum systems; pumps, system operation and design, gauges, leak detection and mass spectrometry. Thin film deposition techniques. Glow discharge sputtering, ion beams. Surface processing. Cryogenics.

63246 COMPUTATIONAL PHYSICS
Four semester hours (3 s/hrs lectures/tutorial)
Prerequisites: 60031 Treatment of Scientific Data, 31871 Computing for Science, 63231 Physics 3
Corequiste: 33330 Physical Mathematics

Introduction to digital techniques in applied physics; data analysis, numerical modlling. Techniques for writing and testing large programmes. Use of computer packages.

63251 NUCLEAR PHYSICS (new)
Three semester hours 1 3/4 s/hr lecture, 3/4 s/hrs practical, 1/2 s/hr tutorial)
Prerequisite: 63341 Quantum Physics 1

Core: Basic properties of nucleus, scattering theory, nuclear forces, nuclear models, nuclear reations, passage of energetic particles through matter, nuclear instrumentation.

Lobe: Fundamental particles, quarks and leptons, "standard theory", grand unified theories, other current theories. Pass students take the core and a brief summary of the lobe plus extra laboratory work. Honours students take the core and the lobe in more detail.

63252 TRANSDUCERS AND DEVICES
Three semester hours (1 1/4 s/hr lecture, 1 3/4 s/hrs tutorial/practical/project)
Prerequisite: 63332 Electronics 1

Device physics. Transducers; p-n junction; field effect transistor; microwave devices. Applications: pressure, flow, vibration, acceleration, strain, position, angle. Optical detection: photonic, thermal, wave=interaction (heterodyne). IR, optical, noise, figure of merit, signal and background noise limitations.

63254 X-RAY TECHNIQUES
Three semester hours (1 1/2 s/hrs lectures, 1/2 s/hr tutorial, 1 s/hr practical/seminar)
Prerequisites: 63231 Physics 3, 63521 Materials Science 1

X-ray generation, absorption and scattering; space group theory; crystal diffractiontheory; application to structure analysis; defects and deformations in crystal, accurate cell dimensions. Quantitative XRF adn XRD.

63255 ELECTRON MICROSCOPY TECHNIQUES
Three semester hours (1 1/2 s/hrs lectures, 1/2 s/hrs tutorial, 1 s/hr practical/seminar)
Prerequisites: 63231 Physics 3, 63235 Applied Optics

Electron microscopy; electron optics, transmission electron microscopy and scanning electron microscopy. Image formation and contrast mechanisms. Electron diffraction. X-ray microprobe analysis.

63263 APPLIED THERMODYNAMICS
Three semester hours (1 1/2 s/hrs lectures, 1 1/2 s/hrs tutorials)
Prerequisite: 63243 Thermodynamics and Energy

Thermodynamic functions and their applications. Analysis of reations, phase changes. Non-equilibrium thermodynamics; thermoelectric effect. Low temperature physics. The thrid law: production of low temperatures. Introduction to kinetic theory; mean free path, calculation of thermal conductivity, resistivity, etc.

63264 SOLID STATE PHYSICS (new)
Three semester hours (1 1/2 s/hrs lectures, 1 1/2 s/hrs practical)
Prerequisites: 63341 Quantum Physics 1, 33221 Engineering Mathematics 2A

Electrons in solids; free electrons, I.CAO, band theory, nearly free electron, tight binding. Insulators, metals and semiconductors: electrical and optical properties of semiconductors. Lattice vibrations; phonons, specific heat. thermal conductivity and expansion.

63271 ADVANCED X-RAY TECHNIQUES
Three semester hours (1 1/2 s/hrs lecture, 1 s/hr practical/seminar, 1/2 s/hr tutorial)
Prerequisites: 63231 Physics 3, 63534 Introduction to Crystallography, 63724 Materials Science 1, 33330 Physical Mathematics

Review of x-ray and neutron scattering theory, coherent and incoherent scattering, intensity calculations for various diffraction systems. Thermal scattering and extinction. Crystal structure refinement and quantitative analysis, Laue symmetry and diffraction pattern calculations. Powder diffractormetry, Convolution and Fourier transform, mathematical analysis of instrumental diffraction profiles, diffraction line profile analysis of crystallite size, strain and defective structures.

63272 ADVANCED ELECTRON MICROSCOPY TECHNIQUES
Three semester hours (1 1/2 s/hrs lecture, 1 s/hr practical seminar, 1/2 s/hr tutorial)
Prerequisites: 63231 Physics 3, 63235 Applied Optics, 33330 Physical Mathematics

Image formation in an electron microscope. Diffraction theories. Contract mechanisms. The transmission and scanning electron microscope. Microprobe and nanoprobe analysis.

63273 ADVANCED SOLID STATE PHYSICS
Three semester hours (2 s/hrs lecture, 1 s/hr tutorial)
Prerequisites: 63264 Solid State Physics, 63351 Quantum Physics 2

Band Structure of Solids: tight-binding method, nearly free electron model; computational techniques. Electron dynamics in electric and magnetic fields; low dimensional systems. Lattice dynamics: phonons, Umklapp processes, harmonic and anharmonic potentials, solitons. Amorphous materials, structure, electronic structure, specific heat, tunnelling processes. Other topics: Superconductivity; percolation; phase transitions.

63281 PROJECT A (2 semester)
Six semester hours (3 s/hrs in each of two semesters)

63282 PROJECT B
Three semester hours

63285 PROJECT (HONOURS)
Twenty semester hours
Prerequisite: 63395 Industrial Training (Honours, Applied Physics)

The project is carried out over two semesters under the supervision of a member of academic staff of the Department of Applied Physics and, if appropriate, an external supervisor. At the end of the first semester the student's work will be assessed on the basis of a short report. Towards the end of the project the student is required to present a talk to a meeting of academic staff. The final report will represent not only the results of the student's work but also an understanding of their significance, an appreciation of other relevant work in the area of the project and an understanding of the underlying physics of the methods employed.

63293 APPROVED EXTERNAL SUBJECT
Three semester hours

63296 APPROVED EXTERNAL SUBJECT
Six semester hours

63332 ELECTRONICS 1
Six semester hours (3 s/hrs lectures/tutorials, 3 s/hrs practical)
Prerequisites: 63221 or 63222 Physics 2 and 63172 Electricity and Magnetism or 63116 Physics for Electronics and 33172 Science Mathematics 2

Review of AC and DC circuit theory, semiconductor theory, diodes and bipolar transistors, basic transistor circuits, introduction to digital electronics, logic gates, latches and counters, JFET and JFET amplifiers, frequency characteristics and feedback in amplifiers, operational amplifiers, oscillators and power electronics.

63333 APPLIED PHYSICS 1
Six semester hours (1 1/2 s/hrs lectures, 4 1/2 s/hrs practical/tutorial)
Prerequisites: 63221 Physics 2, 33163 Science Mathematics 2

Vacuum physics; introduction to the production, measurement and application of vacuum pressures. Pumps for rough, medium and high vacua. Gauges used for measuring. Production and measurement of ultrahigh vacua. Leak detection. Applications. e.g. vacuum coating. Optical instruments and photography; extension of lens and mirror theory to include defects and aberrations. Applications to cameras and other instruments. Densitometry. Workshop practice, including use of tools, basic machines, welding. Engineering drawing, emphasising plane drawing of items for construction in a workshop.

63341 QUANTUM PHYSICS 1
Three semester hours (lecture/tutorials)
Prerequisite: 63331 Physics 3
Corequisite: 33221 Engineering Mathematics 2A

Brief historical introduction, the Schrodinger equation. Time-indempendent solutions for harmonic oscillator, infinite and finite square wells, hydrogen atom, potential steps and barriers. Angular momentum. Orthonomality, interpretation of solutions.

63342 PRINCIPLES OF INSTRUMENTATION
Three semester hours (1 s/hr lecture/tutorial. 2 s/hrs practical)
Prerequisites: 63332 Electronics, 63352 Digital Electronics or 31888 Logic Design 1
Corequisite: 33330 Physical Mathematics

Characteristics of measurement; the role of electronics in instrumentation; signal conditioning; performance characteristics of instruments; noise and its reduction; analysis of signals and instruments.

63348 APPLIED MECHANICS
Three semester hours
Prerequisites: 63221 Physics 2, 33221 Engineering Mathematics 2A

Particle kinetics in various co-ordinate systems. Vibrations: free, forced and damped vibration of single and coupled oscillators. Energy methods for particles and for rigid body systems. Angular momentum in two and three dimensions. Introduction to fluid mechanics; flow of ideal incompressible and compressible fluids. Flow of real fluids; Navier Stokes equation. Similitude. Applications.

63351 QUANTUM PHYSICS 2
Three semester hours (lecture/tutorials)
Prerequisite: 63341 Quantum Physics 1
Corequisite: 33330 Physical Mathematics

Quantum mechanics; time-independent perturbation theory, variational principle, applications. Rotational and vibrational spectra of molecules. Multi-electron atoms. Hartree approximation. Interpretation of quantum theory.

Statistical mechanics and transport phenomena; probability calculations. Isolated systems, fixed-temperature systems, resulting distributions, partition function. Application to paramagnetic solid, ideal gases and other systems. Maxwell velocity distribution. Electrochemical potential. Fermi and Bose distribution functions. Irreversible thermodynamics of linear processes.

63352 ELECTRONICS 2
Three semester hours (1 s/hr lecture, 2 s/hrs practical)
Prerequisite: 63332 Electronics 1

Revision of logic gates, Boolean algebra, Karnaugh maps. Decoding and multiplexers. Flip-flops, structure of counting circuits, digital data storage, registers and memory, RAM, ROM, PROM, parallel-serial conversion, arithmetic circuits, D-A/A-D conversion.

63354 SOLID STATE PHYSICS
Four semester hours (2 s/hrs lectures, 2 s/hrs practical)
Prerequisite: 63341 Quantum Physics 1

Electronics in solids; free electrons, chemical bonds, LCAO, band theory, insulators; metals and semiconductors; electrical and optical properties of semiconductors. Lattice vibrations; phonons, specific heat, thermal conductivity and expansion. Magnetism; para-dia- and ferromagnetism; Curie and Curie-Weiss law; resonance.

63355 EXPERIMENTAL METHODS 2
Three semester hours
Prerequisites: 63335 Experimental Methods 1, 63332 Electronics

Least squares fitting procedures and analysis, numerical noise reduction techniques, transducers and senors; data processing. Measurement of pressure, flow vibration, noise, heat flux, position, angle, surface morphology. Infrared and optical detectors, photon noise.

63357 APPLIED TECHNIQUES
Six semester hours (2 s/hrs lectures/tutorials, 4 s/hrs practical)
Prerequisite: 63571 Materials Science 1
Corequisites: 63331 Physics 3, 63333 Applied Physics 1

X-ray generation, absorption and scattering; space group theory; crystal diffraction theory; application to structure analysis; defects and deformations in crystal, accurate cell dimensions. Quantitative XRF and XRD. Electron microscopy; electron optics, transmission e.m. and scanning e.m.; image formation and contrast mechanisms. Electron diffraction, X-ray microscope analysis.

63358 FIELD THEORY
Three semester hours
Prerequisites: 33330 Physical Mathematics, 63196 Electrotechnology

Solution of electrostatic and magnetostatic problems using Laplace and Poisson equations. Fields in rectangular trough, around a split cylinder. Dielectric sphere in a field. Separation of variables in rectangular, cylindrical and spherical coordinates. Maxwell's equations in integral and differential form. Derivation. Power flow, Poynting vector. Boundary conditions on E.B.D.H. Wave equation in free space. Place wave solutions. Skin effect. Reflection of interfaces. Vector magnetic potential and current distribution. Electric dipole radiation. Waveguides. TE and TM modes.

63361 MICROPROCESSORS IN INSTRUMENTATION
Three semester hours
Prerequisites: 31799 Computing 1, 63332 Electronics, 63352 Digital Electronics or 31888 Logic Design 1

Computer architecture; machine language, computer interfacing; applications of microcomputers in instrumentation, the FORTH language.

63355 PHYSICAL OPTICS
Three semesters
Prerequisite; 63347 Electromagnetism or 63197 Electromagnetic Fields or 63358 Field Theory
Corequisite; 63333 Applied Physics 1

Classical physical optics; dispersion, Fresnel equations; polarisation; interference and interferometry; diffraction, the use of Fourier transforms in diffraction; spatial filtering; laser cavities and amplification; coherence, holography, fibre optics.

63366 NUCLEAR PHYSICS
Two semester hours (1 1/2 s/hrs lectures, 1/2 s/hrs practical)
Prerequisites: 63153 Energy Technology, 63331 Physics 3

Basic properties of nuclei, nuclear decay, nuclear electronics, passage of energetic particles through matter, nuclear models, nuclear reactions, nuclear forces and fields, fundamental particles.

63367 APPLIED TECHNIQUES (2 semester)
Six semester hours (3 s/hrs over 2 semesters)

Equivalent to 63357

63382 COMPUTER MODLLING OF PHYSICAL SYSTEMS
Three semester hours (1 s/hr lecture, 2 s/hr tutorial)
Prerequisites: 63152 Materials Physics, 63246 Computational Physics, 63264 Solid State Physics, 63358 Field Theory
Corequisite: 63263 Applied Thermodynamics, 63351 Quantum Physics 2

Particle methods in modelling. Monte Carlo techniques. Numerical solution of ordinary and partial differential equations that arise in the modelling of physical systems.

63390 THESIS (Applied Physics) F/T

63391 THESIS (Applied Physics) P/T & EXT

63395 INDUSTRIAL TRAINING (APPLIED PHYSICS HONOURS)
Fifteen semester hours
Prerequisite: Preliminary selection into the honours course in Applied Physics. A knowledge of workshop practice and an appreciation of laboratory safety principles.

Students will work for a period of one semester (at least eighteen weeks) on a project or projects which involve the application of physical principles to technological problems of some economic importance to technological problems of some economic importance. The project will be carried out under the direction of an industrial as well as an academic supervisor.

63532 POLYMERS 1
Three semester hours
Prerequisites: 63521 Materials Science 1, 62191 Introductory Organic Chemistry
Corerequisite: 63531 Materials Science 2

The preparation, properties and applications of common commercial plastics. Qualitative analysis of polymers. Number and weight average molecular weights. Bonding, structures and morphology of polymers. Structure/property relationships. Thermal properties of polymers and copolymers. The structures and properties of natural polymers (rubber, wood, cellulose, rosin, wool). Synthetic elastomers and copolymers.

63533 MECHANICAL PROPERTIES OF MATERIALS
Six semester hours
Prerequisite: 63521 Materials Science 1
Corequisite: 33163 or 33172 Science Mathematics 2

Analysis of stress and strain. Mohr's circle. The mechanical behaviour of materials and flow theories. Elasticity and plasticity. Criteria for yielding and fracture. Time dependent deformation, rheological models and internal friction. Creep and stress relaxation in materials. Introduction to fracture mechanics. Fatigue in materials and the application of fracture mechanics in the design against fatigue failure. Standard mechanical tests and the determination of materials property data.

63534 INTRODUCTION TO CRYSTALLOGRAPHY
Two semester hours

Introduction to crystallography, crystal systems, symmetry, Miller indices, the stereographic projection, zone axis theory. Introduction to the reciprocal alattice. X-rays, diffraction methods, interpretation of powder photographs, the determination of crystal structures, intensities of X-ray reflection and intensity calculations. The orientation of single crystals and the determination of texture in polycrystalline materials.

63535 MATERIALS SCIENCE 2
Four semester hours
Prerequisites: 63521 Materials Science 1, 33163 Science Mathematics 2 or 33213 Ordinary Differential Equations, 63221 Physics 2, 62421 Chemistry 2

Introduction to quantum mechanics and quantum numbers applied to atomic structure. Bond theory of solids. Electrical properties - conductivity, semi-conduction and p-n junctions, superconductivity, dielectric properties. Thermal properties - heat capacity, thermal conductivity and thermoelectric power. Magnetic properties - atomic magnetism, magnetisation curves and hysteresis, domain theory, magnetic materials.

63541 PHYSICAL METALLURGY 1
Four semester hours
Prerequisites: 63521 Materials Science 1, 63531 Materials Science 2, 62192 Themodynamics

The application of thermodynamic principles to phase equilibrium and transformations in metal alloy systems. The fundamentals of nucleation and solidification of metals and their alloys. Theories of diffusion in metals. Commercial alloys and industrial heat treatment processes. The preparation and examination of metallic macrostructures and microstructures.

63542 POLYMERS 2
Four semester hours
Prerequisite: 63532 Organic Materials 1

The mechanisms, kinetics and statistics of polymerisation reactions. Copolymerisation reactions. Polymerisation conditions. The solution properties of polymers. Polymer fractionation and characterisation (DSC, TGA, etc). Molecular weights and their determination. Fillers, plasticisers and other additives. Industrial excursions.

63543 MATERIALS SCIENCE 3
Three semester hours
Prerequisite: 63531 Materials Science 2

Magnetic Properties: fundamental, diamagnetism, paramagnetism and ferromagnetism, magnetisation and hysteresis, domain theory, magnetic materials, anisotropy, magnetostriction, soft and hard magnets and their application.

Optical Properties: light and related phenomena - polarisation, reflection, refraction, isotropic - anistropic media, sources of colour - absorption and transmission, dispersion. Raman spectroscopy. Application - X-rays, luminescence - fluorescence and phosphorescence, lasers. Introduction to electron optics.

Resonance: NMR - principles, experimental methods, diffusion in solids, deformation in metals. ESR - principles, experimental methods - applications in metals, ionic crystals, semiconductors and ferromagnetics.

63546 CERAMICS 1
Four semester hours
Prerequisites: 63521 Materials Science 1 or 63724 Introduction to Materials Science

Construction and interpretation of binary and ternary phase diagrams and their applications. Structure and classification of ceramic materials with special emphasis on clay minerals. Phase transformations in silica and alumina silicate systems.

Raw materials, pressing, extrusion and slip casting of clay products. Clay, heavy clay and whiteware manufacturing methodologies, cation exchange and properties of clay based ceramics. Structure and chemistry of cements and concretes. Introduction to refractories and ceramic microstructures.
Industrial excursions.

63551 PHYSICAL METALLURGY 3
Four semester hours
Prerequisites; 63541 Physical Metallurgy 1, 63533 Mechanical Properties of Materials

The principles and application of foundry technology, welding technology and powder metallurgy. An introduction to the theory and application of non-destructive testing techniques applied to the examination of metal components and structures. Industrial excursions and technical inspections.

63553 MATERIALS DEGRADATION
Two semester hours
Prerequisites: 63546 Ceramic Materials 1, 63542 Organic Materials 2, 63556 Ceramics 2

The environmental degradation of ceramics, plastics and rubber. Techniques employed for the measurement of degradation of non-metallic materials.

63556 CERAMICS 2
Four semester hours
Prerequisites: 63546 Ceramics 1, 62192 Thermodynamics

Structure and composition of glasses. Phase transformations and nucleation in glass systems and the applications in glass ceramics and glazes.

Chemical and physical strengthening of glasses and glass ceramics. Glass fibres and their applications in optical communication.

Raw materials used in glass manufacture of commercial glasses.
Industrial excursions.

63562 POLYMERS 3
Four semester hours
Prerequisite: 63532 Organic Materials 1

The mechanical properties and testing of polymers. Viscoelasticity and creep. Polymer rheology, processing and fabrication. The chemical, physical and engineering properties of rubber and elastomers. Optical properties of polymers, birefringence and phtoelasticity. Textiles, fibres and new polymers. Other organic materials (fuels, oil, paper). Paint, coating, adhesives.
Industrial excursions.

63563 SURFACE PROPERTIES OF MATERIALS
Four semester hours
Prerequisites: 62192 Thermodynamics, 63542 Organic Materials 2, 63544 Physical Metallurgy 2, 63546 Ceramics 1

Basic surface properties, themodynamics of surfaces, electrical double layer theories, adsorption/desorption phenomena, surface active agents. Applications in adhesion, catalysis, lubrication and wear characteristics.

63566 CERAMICS 3
Four semester hours
Prerequisites: 63531 Materials Science 2, 63533 Mechanical Properties of Materials, 63546 Ceramics 1

Structural imperfections and defect mechanisms. Kroger-Vink notations, diffusion in ceramics and solid state electrolytes. Solid reactions, sintering theories, densification and grain growth. Advanced production methods. Solid solutions and molecular engineering in ceramics with oxides, nitrides and carbides.

Mechanical properties and designing with brittle materials. Reliability and probability analysis in ceramics. Thermal magnetic and electrical ceramic properties and production methodologies.

Toughening mechanisms and introduction to Ceramic Composites.
Industrial excursions.

63567 DESIGN AND MATERIALS SELECTION
Two semester hours
Prerequisites: 63544 Physical Metallurgy 2, 63546 Ceramics 1, 63542 Organic Materials 2

This subject is an examination of the decision-making processes which an engineer or technologist employs to originate, evolve and proportion a device, a machine component or structural system. Material selection and specification, a critical factor in this process is examined in regard to material characteristics, inservice performance, aesthetic and economic factors, and other matters that must be considered in the design process. Various case histories are studied.

63568 COMPOSITES
Two semester hours
Prerequisites: 63544 Physical Metallurgy 2, 63551 Physical Metallurgy 3, 63542 Organic Materials 2, 63562 Organic Materials 3, 63556 Ceramics 2, 63566 Ceramics 3
Corequisite: 63563 Surface Properties of Materials

Mechanical properties, fracture mechanics and failure analysis of polymer, metallic and ceramic matrix composites. Properties of fibres, weaves, fabrics and pregs. their manufacturing and processing requirements. Properties of advanced materials and composites and their selection.

Advanced polymers, co-polymers and polymeric matrix composites. Design and properties of high temperature metal alloys and metal matrix composites, manufacturing methodologies and behaviour. Toughening of mechanisms in ceramic matrix composites and manufacturing with advanced ceramics.

63590 THESIS (Materials Science) F/T

63591 THESIS (Materials Science) P/T & EXT

63596 INDUSTRIAL TRAINING 1 (Materials Science)

63597 INDUSTRIAL TRAINING 2 (Materials Science)

63598 INDUSTRIAL TRAINING P/T (Materials Science)

63704 MATERIALS ENGINEERING 1
Three semester hours
Prerequisites: 42611 Mechanics 1, 62171 Engineering Chemistry

This subject is a basic introduction to materials science. It provides a foundation in terms of microscopic structure and composition for the understanding of the behaviour of engineering materials. Topics dealt with include atomic structure of solids, phase diagrams, properties of metals and alloys, corrosion, polymers and rubbers, ceramics, timber and composites.

63711 MATERIALS 1
Three semester hours average

An introductory course in the properties of building materials. Most commonly used materials are covered but not in depth.

63721 MATERIALS SCIENCE FOR ENGINEERS
Three semester hours
Corequisites: 62178 Engineering Chemistry, 43521 Mechanics of Solids 1

This subject deals with the basic properties of engineering materials. In a materials science section the major topics are classification and structure of solids; primary and secondary bonding: metals, polymers and ceramics, heat treatment and joining methods: durability and corrosion. In a second section of mechanical properties of materials and major topics are the behaviour of materials subjected to tensile and compressive loads: hardness; theories of failure. The lecture programme is supported by a programme of laboratory demonstrations and experiments.

63741 MATERIALS ENGINEERING 2
Three semester hours
Prerequisites: 33222 Engineering Mathematics 2B, 42631 Mechanics 3

This subject is an introduction to the behaviour of mechanical vibrations. The content includes free and forced response of spring/mass/damper systems, two- and multi-degree of freedom systems, torsional vibrations and transverse vibration of beams. Laplace transformation, mechanical impedance and matrix methods are used and both analytical and computer based numerical solutions are presented.

63724 MATERIALS SCIENCE 1
Four semester hours
Prerequisites: 62411 Chemistry 1, 63211 Physics 2, Corequisites: 62421 Chemistry 2, 63221 Physics 2, 33171 Science Mathematics 1

Introduction to the crystalline structure and physical properties of solids. Structure sensitive and structure insensitive properties. The properties of metals and metallic alloys in terms of modern theories. The control of structure and properties of commercially important alloys. Introduction to the structure and properties of polymer and ceramic materials and the techniques employed to modify their properties. Introduction to the mechanical testing of materials. The effects of stress state temperature straining rate and repetitive loadings on the behaviour of materials (creep, fatigue and brittle fracture).

63734 MATERIALS TECHNOLOGY
Three semester hours
Prerequisite: 63113 Engineering Physics 1 (Elec)

The objectives of the subject are to develop the student's familiarity with commonly used electrical engineering materials to the extent that he or she would classify them in order of hardness, strength, thermal and electrical conductivity, density, dielectric constant and permeability.

Materials covered include ferrous and non-ferrous metals, plastics and ceramics. The subject includes the topics of measurement of material properties, joining techniques. General production techniques and the selection methods are covered but the the emphasis is placed on the properties and selection of metals ceramics, polymers and composites in electronic devices and instruments.

63842 - 63849 PROJECT
Two to nine semester hours

63858 PROJECT P/T
Eight semester hours (4 s/hrs over 2 semesters)

63859 PROJECT P/T
Nine semester hours (4.5 s/hrs over 2 semesters)

63955 READINGS/LITERATURE ASSIGNMENT (Higher Degree)

63966 PROJECT (Higher Degree)

SCHOOL
OF
BIOLOGICAL AND
BIOMEDICAL SCIENCES

INTRODUCTION TO THE SCHOOL

The School of Biological and Biomedical Sciences has, since its inception in 1970, built up a proud record in teaching, research and consultancy.

Located at the St. Leonards Campus of the University of Technology, Sydney, the School offers:

Four undergraduate degrees:
- Biomedical Science
- Biotechnology
- Environmental Biology
- Urban Horticulture

Five Masters Degrees by Course Work:
- Clinical Biochemistry
- Clinical Measurement
- Environmental Toxicology
- Medical Physics
- Coastal Resource Management - (in collaboration with other UTS Faculties)

Research degrees at three levels:
- Honours
- Masters
- Doctoral

Graduate Certificates in Biomedical Technology:
- Computer Data Acquisition in the Life Sciences
- Data Processing and Management in the Life Sciences
- Electronics and Computing in the Life Sciences
- Human Biology
- Medical Instrumentation and Measurement
- Physics in Medicine

Most programmes are available on a full-time and part-time basis or a combination of both these attendance patterns.

While the University of Technology, Sydney maintains traditional university standards of scholarly excellence in the granting of its awards, it is continually seeking to instruct students in new and innovatory areas in keeping with the needs of our highly technological society.

RESEARCH ACTIVITIES

The School of Biological and Biomedical Sciences has a strong record of research and development, essential to the strength of both undergraduate and postgraduate programmes. Details of current research projects can be seen from the list of staff members and further details can be provided by the school on enquiry to the Administrative Officer. The School has been funded by the following bodies for research work:

National Health and Medical Research Council;
Australian Research Council;
American Muscular Dystrophy Foundation;
Australian Muscular Dystrophy Foundation;
State Pollution Control Commission;
Department of Science and the Environment;
Australian Water Resources Council;
Ramaciotti Foundation;
Private Donations;
Shell Company of Aust., Ltd.;
Telectronics Pacing Systems;
CSIRO/UTS Collaborative Research Grants;
UTS Research Grants;
NSW Cancer Council.

RESEARCH UNITS WITHIN THE SCHOOL

IMMUNOBIOLOGY UNIT

The Immunobiology Unit was established in 1989 as a multidisciplinary laboratory undertaking research into basic and applied aspects of the immune system. The activities of the Unit are funded almost entirely by external competitive research grants such as those awarded by NHMRC, ARC and various private foundations.

NEUROBIOLOGY UNIT

The Neurobiology Unit was established in 1973 within the Department of Biochemistry and Physiology. The unit carries out applied and basic research into the nervous system and the effect of emotional states on the immune system and cancer recurrence. It also trains postgraduate research students. The unit is funded through donations by the community and business sectors.

COLLABORATIVE RESEARCH UNITS

CENTRE FOR ENVIRONMENTAL TOXICOLOGY

The State Pollution Control Commission (SPCC) in conjunction with the University of Technology, Sydney, has set up a Centre for Environmental Toxicology in the School of Biological and Biomedical Sciences. The centre has facilities for toxicological testing and chemical analysis. It carries out applied research in the area of environmental toxicology and develops toxicological tests and monitoring procedures for the Australian environment. It also provides a research centre for students, visiting scientists and a toxicological testing service for industry. Staff of the Centre are involved in teaching aspects of the Masters in Environmental Toxicology programme.

GORE HILL RESEARCH LABORATORIES

The Gore Hill Research Laboratories, which include an animal house, a plant tissue culture laboratory, and an electron microscope unit, is situated in the grounds of the Royal North Shore Hospital. The laboratories are a joint venture between the Hospital and the University of Technology, Sydney and are used by both institutions.

Animals are used by the hospital for diagnostic and surgical investigations and by the School for teaching and research work.

The general plant biotechnology and tissue culture laboratories are used extensively by Environmental Biology and Urban Horticulture students.

The electron microscope facility is jointly operated by the Royal North Shore Hospital and UTS. The transmission electron microscope and scanning electron microscope are used for teaching, diagnostic medical work and research.

CENTRE FOR BIOMEDICAL TECHNOLOGY

The Centre for Biomedical Technology is an inter-faculty network of research and education teams within the University, working in the field of biomedical technology. It integrates the University's diverse expertise and resources to enhance the scientific and technological base for the biomedical technology industry, government and health care providers.

Staff from the Schools of Biological and Biomedical Sciences, Electrical Engineering, Mechanical Engineering, Physical Sciences, Mathematical Sciences, Computing Sciences, Nursing Therapeutics and Physical and Health Education are involved.

The Centre aims to facilitate and coordinate biomedical technology research, promote continuing education in the field, develop quality medical devices and products and provide consultation to the biomedical technology industry.

ADMINISTRATIVE MATTERS

UNDERGRADUATE COURSES: ASSUMED KNOWLEDGE / COURSE PREREQUISITES

There are no mandatory prerequisite subjects from the Higher School Certificate; all Science subjects taught in the first semester assume no H.S.C. knowledge of the subject. However, it is assumed that all students entering the course will have studied at least 2 Unit Mathematics plus one 2 Unit Science course. You will be very well prepared if you have done 2 Unit Maths plus 4 or more Units of Science. Common combinations include Chemistry/Physics, Chemistry/Biology, or Multistrand with Biology. Last year the minimum Tertiary Entrance Rank [TER] needed for entry to Urban Horticulture was 66.05, and for Biotechnology, Environmental Biology, and Biomedical Science the TER needed was 72.85. However, these vary from year to year dependent upon the number of applications for entry and the number of places available.

COURSE STRUCTURE

The School offers four undergraduate degree programmes, in **Biomedical Science, Biotechnology, Environmental Biology** and **Urban Horticulture.**

The degree programmes are organised into 'Stages'. Each Stage represents a full-time study load for one semester. Thus for full-time students subjects for Stages 1, 3 and 5 run in the Autumn Semester, while subjects for Stages 2, 4 and 6 run in Spring Semester.

Full-time and part-time programmes for Stages 1 and 2 are the same in each of the first three degree programme mentioned above, while Urban Horticulture students do not share all first year subjects in common with the other degrees. Most subjects in Stages 1 and 2 are offered in both semesters. Repeat subjects are not offered unless student numbers warrant it. This means that students who have failed subjects cannot be guaranteed a complete programme or 'normal progression'. However, a subject failed with a mark of 40 or more may allow progression into subjects for which the failed subject is a prerequisite. All failed subjects must be successfully completed for award of degree.

Students having difficulty devising a programme, should consult the Student Administrative Officer, or an academic adviser. Where a student experiences legitimate difficulty enrolling in sufficient subject hours to make up a full-time load (see 1. b, below), a minimum of 75% of a normal full-time programme is deemed adequate to maintain designation as a full-time student provided the whole degree is completed within 150% of the normal progression period, ie a 3 year full-time degree should be completed in or under, 4.5 years. Similarly, there is no minimum number of subject hours for a part-time programme for any one semester, but the whole degree should be completed within 150% of the normal progression period, ie a 6 year part-time degree should be completed in or under 9 years.

REQUIREMENTS FOR AWARD OF THE DEGREE

A Degree will be awarded to students satisfactorily completing the following requirements:

1. Hours

(a) A minimum of 135 semester hours class work, accumulated by:

(b) Full-time attendance in bachelor's degree courses involving attendance at the University for 24 hours per week for the first four stages of the course, 21 hours for the fifth stage and 18 hours per week for the last stage of the course:

OR

(c) Part-time attendance in bachelor's degree courses involving attendance at the University for 12 hours per week for the first four and a half stages of the course and 9 hours for the last one and a half stages of the course:

OR

(d) Any other approved combination of full-time and part-time attendance.

2. Professional/Work Experience - Full-Time Students

Full-time students in Biomedical Science, Biotechnology or Environmental Biology who desire to complete a period of work/industrial experience during their degree programme may either insert a sandwich year of full-time employment between Stages 4 and 5 or may complete Stages 5 and 6 on a part-time basis. Students are required to inform the University officially if they intend not to appear for formal courses during a sandwich year, by enrolling for the subject - Professional Experience.

3. Professional/Work Experience - Part-Time Students

Part-time students who are employed on a full-time basis in an area relevant to their course (other than in Urban Horticulture - see below) should enrol in the subject 91999 - Professional Experience in every semester for which they are employed.

4. Double Majors in Biomedical Science Degree

It is possible for Biomedical Science students to complete two major strands of subjects in the degree programs. This entails undertaking an additional 15 semester hours. In order to be credited with a double major students must:

(a) apply to the School for approval to complete a double major and obtain an approved programme,

(b) complete all mandatory and elective subjects of a single major totalling 135 semester hours,

(c) complete all remaining mandatory subjects and/or extra elective subject(s) totalling 15 semester hours minimum under the second major. A minimum total of 150 semester hours is required to be eligible for graduation with a double major,

(d) students must have completed, or expect to complete in the current semester, all subjects required for award of the degree before applying for graduation. The double major must be indicated on the application for award. The names of both completed majors will appear at the bottom of their academic record.

COMMENCEMENT OF STUDIES

Lectures and practical laboratory classes offered by the School of Biological and Biomedical Sciences commence on the Monday of the first week in March.

HONOURS STUDENTS PLEASE NOTE: Full-time Honours degree students who have accepted an offer of enrolment are required to have commenced their programme on or before the Monday of the first week in February. Contact your Supervisor for details.

BIOMEDICAL SCIENCE DEGREE COURSE

The Biomedical Science Degree offered by the School of Biological and Biomedical Sciences consists of an initial programme of biology, chemistry, physics, mathematics, statistics and computing followed by microbiology, biochemistry, pathology and bioinstrumentation. Students then select a major strand to follow for the remainder of the course, either Biochemistry, Microbiology or Cellular Pathology, the students undertake a number of electives which introduce them to important areas of biomedical science.

The undergraduate training provides a solid background in the physical sciences and emphasizes practical experimentation. In the final stages of the course, research activities are encouraged through project assignments. Students acquire familiarity with advanced instruments and technology. They are encouraged to participate in seminar activities. The purpose of the course is to educate people in a number of interface areas between modern technology, biology and medicine.

Employment Opportunities

A wide range of employment opportunities is available to graduates. Biomedical scientists work closely with clinical pathologists, surgeons and other medical specialists in the control and elimination of disease. There is a growing demand for Biomedical Scientists in the Commonwealth and State Health Departments, the Repatriation Department, CSIRO, Universities, pharmaceutical firms, veterinary laboratories and private pathology laboratories.

Course Structure

You can complete the degree in three years full-time or six years part -time or a combination of both these attendance patterns. Subjects are divided into core subjects and 'elective' subjects. All students enrolled in the degree must satisfactorily complete all core subjects for award of the degree and, in addition, must satisfactorily complete the required number of hours of elective subjects. Students generally choose elective subjects with a particular theme or area of expertise in mind.Examples of recommended electives are given in Elective Options Table, however, it should be noted that timetable constraints may prevent the undertaking of some elective combinations.

Elective combinations include:

1 a particular area of study via subjects available from within the School of Biological and Biomedical Sciences
2 further study in areas of interest via subjects from other faculties of UTS
3 other individual elective sequences as may be approved by the Head of School, for example from another university.

FULL-TIME PROGRAMME

Stages 1 to 4 are common to all three major strands of the Biomedical Science degree.

Stage 1		*Hours / Week*
Autumn Semester		
33101	Mathematics 1 (L/S)	3
33103	Statistics (L/S)	3
62416	Chemistry 1 (L/S)	6
63111	Physics 1 (L/S)	6
91311	Biology 1	6
Stage 2		
Spring Semester		
33105	Introductory Biometrics	3
62426	Chemistry 2 (L/S)	6
91312	Biology 2	6
91317	Human Biology	6
91395	Biocomputing	3
Stage 3		
Autumn Semester		
91313	Biochemistry 1	6
91314	Microbiology 1	6
91316	Bioinstrumentation	6
91354	Anatomical Pathology	6
Stage 4		
Spring Semester		
91320	Biochemistry 2	6
91326	Analytical Biochemistry	6
91330	Microbiology 2	6
91355	Haematology 1	3
91351	Immunology 1	3

For final year subject programme (Stages 5 & 6) see the programmes for individual majors which follow the part-time programme.

PART-TIME PROGRAMME

Stages 1 to 4 are common to all three major strands of the Biomedical Science degree.

Stage 1		*Hours /Week*
Autumn Semester		
33101	Mathematics 1 (L/S)	3
62417	Chemistry 1 (L/S) (P/T) (2 Sem)	3
63112	Physics 1 (L/S) (P/T) (2 Sem)	3
91301	Biology 1 (P/T) (2 Sem)	3

Spring Semester		*Hours/Week*
33103	Statistics (L/S)	3
62417	Chemistry 1 (L/S) (P/T) (2 Sem)	3
63112	Physics 1 (L/S) (P/T) (2 Sem)	3
91301	Biology 1 (P/T) (2 Sem)	3

Stage 2

Autumn Semester		
91312	Biology 2	6
91317	Human Biology	6

Spring Semester		
33105	Introductory Biometrics	3
62426	Chemistry 2 (L/S)	6
91395	Biocomputing	3

Stage 3

Autumn Semester		
91313	Biochemistry 1	6
91314	Microbiology 1	6

Spring Semester		
91316	Bioinstrumentation	6
91330	Microbiology 2	6

Stage 4

Autumn Semester		
91326	Analytical Biochemistry	6
91354	Anatomical Pathology	6

Spring Semester		
91320	Biochemistry 2	6
91355	Haematology 1	3
91351	Immunology 1	3

For subject programmes for Stages 5 & 6 see the programmes for individual majors which follow.

BIOCHEMISTRY MAJOR

FULL-TIME PROGRAMME

Stage 5		*Hours /Week*
Autumn Semester		
91321	Biochemistry 3	6
91342	Clinical Biochemistry 1	3
	And either:-	
91331	Microbiology 3	6
	or	
91358	Haematology 2	6
	Plu	
*	Electives	6

Stage 6		*Hours/Week*
Spring Semester		
91322	Biochemistry 4	6
91343	Clinical Biochemistry 2	3
Plus		
*	Electives	9

TOTAL ELECTIVE HOURS TO BE COMPLETED - 15

PART-TIME PROGRAMME

Stage 5		*Hours / Week*
Autumn Semester		
91321	Biochemistry 3	6
91342	Clinical Biochemistry 1	3
*	Elective	3

Spring Semester		
91322	Biochemistry 4	6
91343	Clinical Biochemistry 2	3

Stage 6

Autumn Semester		
91331	Microbiology 3	6
	or	
91358	Haematology 2	6
	Plus	
*	Elective	3

Spring Semester		
*	Electives	9

TOTAL ELECTIVE HOURS TO BE COMPLETED - 15

* For details of the electives available for the Biochemistry Major Biomedical Science see Elective Options Table

CELLULAR PATHOLOGY MAJOR

FULL-TIME PROGRAMME

Stage 5		*Hours /Week*
Autumn Semester		
91356	Diagnostic Cytology 1	6
91358	Haematology 2	6
	Plus	
*	Electives	9

Stage 6		*Hours/Week*
Spring Semester		
91341	Blood Bank	3
91357	Diagnostic Cytology 2	6
	Plus	
*	Electives	9

TOTAL ELECTIVE HOURS TO BE COMPLETED - 18

PART-TIME PROGRAMME

Stage 5*Hours/Week*		*Hours /Week*
Autumn Semester		
91356	Diagnostic Cytology 1	6
	Plus	
*	Electives	6
Spring Semester		
91357	Diagnostic Cytology 2	6
	Plus	
*	Electives	3
Stage 6		
Autumn Semester		
91358	Haematology 2	6
	Plus	
*	Electives	3
Spring Semester		
91341	Blood Bank	3
	Plus	
*	Electives	6

TOTAL ELECTIVE HOURS TO BE COMPLETED - 18

* For details of the electives available for the Cellular Pathology Major Biomedical Science see Elective Options Table

MICROBIOLOGY MAJOR

FULL-TIME PROGRAMME

Stage 5		*Hours / Week*
Autumn Semester		
91331	Microbiology 3	6
	Plus	
*	Electives	9
And either:-		
91321	Biochemistry 3	6
or		
91358	Haematology 2	6

Stage 6		*Hours/Week*
Spring Semester		
91372	Clinical Bacteriology & Parasitology	9
	Plus	
*	Electives	9

TOTAL ELECTIVE HOURS TO BE COMPLETED - 18

* For details of the electives available for the Microbiology Major Biomedical Science see Elective Options Table.

PART-TIME PROGRAMME

Stage 5		*Hours / Week*
Autumn Semester		
91331	Microbiology 3	6
	Plus	
*	Electives	6
Spring Semester		
91372	Clinical Bacteriology & Parasitology	9
Stage 6		
Autumn Semester		
91321	Biochemistry 3	6
	or	
91358	Haematology 2	6
	Plus	
*	Electives	3
Spring Semester		
*	Electives	9

TOTAL ELECTIVE HOURS TO BE COMPLETED - 18

* For details of the electives available for the Microbiology Major Biomedical Science see Elective Options Table.

ELECTIVES TABLE FOR BIOMEDICAL SCIENCE COURSE

SUBJECT No Micro	Name	Semester Hrs	A/S	MAJOR STRAND Biochem	CellPath	
91321	Biochemistry 3	6	A	—	5	5
91322	Biochemistry 4	6	S	—	6	6
91331	Microbiology 3	6	A	5	5	—
91334	Molecular Biology 1	3	A	5	5	5
91335	Molecular Biology 2	6	S	6	6	6
91337	Clinical Microbiology	3	A	5	5	5
91341	Blood Bank	3	S	6	—	6
91342	Clinical Biochemistry 1	3	A	—	5	5
91343	Clinical Biochemistry 2	3	S	—	6	6
91350	Pharmacology & Toxicology	3	S	6	6	6
91358	Haematology 2	6	A	5	—	5
91359	Immunology 2	6	S	6	6	6
91368	Microbial Technology 1	6	A	5	5	5
91369	Microbial Technology 2	6	S	6	6	6
91372	Clinical Bacteriology & Parasitology	9	S	6	6	—
91373	Clinical & Applied Mycology	3	S	6	6	6
91374	Tissue Culture	3	A	5	5	5
91396	Advanced Biocomputing	3	S	6	6	6
99995	General Studies Elective (ie. a subject from another School or Faculty)	3	A&S	5 or 6	5 or 6	5 or 6

KEY:

Hrs	=	Hours per week for that subject
A	=	Timetabled for Autumn Semester
S	=	Timetabled for Spring Semester
—	=	Core subject for that Course
5 or 6	=	Recommended Elective

NOTES:

1. Subjects marked 5 and 6 can be undertaken by Part Time students when programmable provided the prerequisite requirements are met
2. Due to timetabling constraints, not all electives may be available to all students in any given semester.
3. Subjects not marked may be able to be taken as electives following discussion with an appropriate member of Academic Staff.

BIOTECHNOLOGY DEGREE COURSE

The UTS Bachelor of Applied Science - Biotechnology, is fully recognised for membership of both the Australian Institute of Biology Inc. (AIB) and the Australian Society of Microbiology (ASM) as well as being a professional qualification with emphasis on DNA technology and its applications. The course encompasses basic sciences plus microbiology, biochemistry, immunology and genetics, industrial biotechnology and molecular biology. At the completion of the course students will have acquired a sound background in industrial microbiology, and competence in a wide range of standard biological, microbiological and biochemical laboratory techniques.

Employment Opportunities

Today's biotechnologist has an expanding variety of career opportunities, and graduates from this degree can expect to find employment opportunities in the food, beverage, chemical, pharmaceutical and fermentation industries, particularly in production, quality control, or research and development areas. These industries depend on a high level of professional competence in standard techniques of microbiology and biochemistry. An increasing number of products involve the application of some of the molecular or other aspects of biotechnology in their manufacture. A variety of research and development opportunities, such as AIDS or Legionnaire's disease research, or the production of transformed plants or animals with 'designer genes'. Good employment opportunities also exist with state and federal government scientific instrumentalities, and

in research and other laboratories in tertiary institutions, hospitals and industry. In recent years a number of smaller, specialised development and consulting companies have developed from biotechnology research programs, these organisations require graduates with a strong basis in biotechnology and applied microbiology. Many employers in the biotechnology field, being themselves active in research and development, have close links with tertiary education institutions, and can offer graduates the possibility of higher degree studies in conjunction with employment.

Course Structure

You can complete the degree in three years full -time or six years part-time or a combination of both these attendance patters. Subjects are divided into core subjects and 'elective' subjects. All students enrolled in the degree must satisfactorily complete all core subjects for award of the degree and, in addition, must satisfactorily complete a total of twelve hours of elective subjects.Students generally choose elective subjects with a particular theme or area of expertise in mind. Examples of recommended electives are given in Elective Options Table, however, it should be noted that timetable constraints may prevent the undertaking of some elective combinations.

Elective combinations include:

1 a particular area of study via subjects available from within the School of Biological and Biomedical Sciences
2 further study in areas of interest via subjects from other faculties of UTS
3 other individual elective sequences as may be approved by the Head of School, including subjects offered by other universities..

FULL-TIME PROGRAMME

Stage 1		*Hours / Week*
Autumn Semester		
33101	Mathematics 1 (L/S))	3
33103	Statistics (L/S)	3
62416	Chemistry 1 (L/S)	6
63111	Physics 1 (L/S)	6
91311	Biology 1	6
Stage 2		
Spring Semester		
33105	Introductory Biometrics	3
62426	Chemistry 2 (L/S)	6
91312	Biology 2	6
91317	Human Biology	6
91395	Biocomputing	3
Stage 3		Hours/Week
Autumn Semester		
91313	Biochemistry 1	6
91314	Microbiology 1	6
91315	Biomonitoring	3
91316	Bioinstrumentation	6
91376	Environmental Measurement	3
Stage 4		
Spring Semester		
91320	Biochemistry 2	6
91326	Analytical Biochemistry	6
91330	Microbiology 2	6
91351	Immunology 1	3
91373	Clinical & Applied Mycology	3
Stage 5		
Autumn Semester		
91331	Microbiology 3	6
91368	Microbial Technology 1	6
91334	Molecular Biology 1	3
	Plus	
*	Electives	6
Stage 6		
Spring Semester		
91335	Molecular Biology 2	6
91369	Microbial Technology 2	6
	Plus	
*	Electives	6

TOTAL ELECTIVE HOURS TO BE COMPLETED - 12

* For details of the electives available for the Biotechnology Degree see Elective Options Table

PART-TIME PROGRAMME

Stage 1		*Hours / Week*
Autumn Semester		
33101	Mathematics 1 (L/S))	3
62417	Chemistry 1 (L/S) (P/T) (2 Sem)	3
63112	Physics 1 (L/S) (P/T) (2 Sem)	3
91301	Biology 1 (P/T) (2 Sem)	3
Spring Semester		
33103	Statistics (L/S)	3
62417	Chemistry 1 (L/S) (P/T) (2 Sem)	3
63112	Physics 1 (L/S) (P/T) (2 Sem)	3
91301	Biology 1 (P/T) (2 Sem)	3
Stage 2		
Autumn Semester		
91312	Biology 2	6
91317	Human Biology	6

Spring Semester		*Hours/Week*
33105	Introductory Biometrics	3
62426	Chemistry 2 (L/S)	6
91395	Biocomputing	3
Stage 3		
Autumn Semester		
91313	Biochemistry 1	6
91314	Microbiology 1	6
Spring Semester		
91316	Bioinstrumentation	6
91330	Microbiology 2	6
Stage 4		
Autumn Semester		
91326	Analytical Biochemistry	6
91376	Environmental Measurement	3
91315	Biomonitoring	3
Spring Semester		
91320	Biochemistry 2	3
91351	Immunology 1	3
91373	Clinical & Applied Mycology	3
Stage 5		
Autumn Semester		
91331	Microbiology 3	6
91334	Molecular Biology 1	3
	Plus - optional	
*	Elective	3
Spring Semester		
91335	Molecular Biology 2	6
	Plus	
*	Electives	3 or 6
Stage 6		
Autumn Semester		
91368	Microbial Technology 1	6
	Plus	
*	Electives	3 or 6
Spring Semester		
91369	Microbial Technology 2	6
	Plus	
*	Electives	3 or 6

TOTAL ELECTIVE HOURS TO BE COMPLETED - 12

* For details of the electives available for the Biotechnology Degree see Elective Options Table

ENVIRONMENTAL BIOLOGY DEGREE COURSE

The UTS Bachelor of Applied Science - Environmental Biology, is fully recognised for membership of the Australian Institute of Biology Inc.and fully qualifies you as a biological scientist with specialisation in environmental science.

The course provides you with a degree in biological science and the advanced technological skills to tackle complex environmental problems such as an ability to apply sampling and measurement methods for such purposes as pollution monitoring or the preparation of environmental assessments. After foundation studies in the basic sciences, you will specialise in the ecology and physiology of plants, animals and micro-organisms, and in freshwater, marine and terrestrial ecosystems. You will also take part in field trips to many parts of the State, for example north and south coastal areas, Snowy Mountains, the Murrumbidgee Irrigation Area and the far west. **Students should note that excursions may be held in the week prior to semester.**

Employment Opportunities

Graduates of the course may be employed as scientific officers with government agencies such as the Water Board, State Pollution Control Commission, Department of Environment and Planning, National Parks and Wildlife Service, museums and herbaria; with local government authorities; or as technical and research officers with universities and colleges, or as environmental consultants or environmental, toxicological or biological scientists in private enterprise. Many organisations provide opportunities for graduates to undertake research projects for a higher degree in the School.

Course Structure

You can complete the degree in three years full-time or six years part-time or a combination of both attendance patterns. Subjects are divided into 'core' subjects and 'elective' subjects. All students enrolled in the degree must satisfactorily complete all core subjects for award of the degree., and in addition, must satisfactorily complete a total of fifteen hours of elective subjects. Students generally choose elective subjects with a particular theme or area of expertise in mind.Examples of recommended electives are given in Elective Options Table, however, it should be noted that timetable constraints may prevent the undertaking of some elective combinations.

Elective combinations include:

1 a particular area of study via subjects available from within the School of Biological and Biomedical Sciences

2 further study in areas of interest via subjects from other faculties of UTS
3 other individual elective sequences as may be approved by the Head of School, including for example, subjects offered by another university.

FULL-TIME PROGRAMME

Stage 1		*Hours /Week*
Autumn Semester		
33101	Mathematics 1 (L/S))	3
33103	Statistics (L/S)	3
62416	Chemistry 1 (L/S)	6
63111	Physics 1 (L/S)	6
91311	Biology 1	6
Stage 2		
Spring Semester		
33105	Introductory Biometrics	3
62426	Chemistry 2 (L/S)	6
91312	Biology 2	6
91317	Human Biology	6
91395	Biocomputing	3
Stage 3		
Autumn Semester		
91313	Biochemistry 1	6
91314	Microbiology 1	6
91316	Bioinstrumentation	6
91360	Quantitative Ecology	6
Stage 4		
Spring Semester		
91362	Plant Ecophysiology	6
91363	Animal Ecophysiology	6
Plus any 2 of:		
91326	Analytical Biochemistry	6
91330	Microbiology 2	6
91320	Biochemistry 2	6
Stage 5		
Autumn Semester		
91364	Aquatic Ecology	6
91365	Terrestrial Ecology	6
	Plus	
*	Electives	9
Stage 6		
Spring Semester		
91366	Pest Control and Toxicology	6
91367	Applied Ecology	6
	Plus	
*	Electives	6

PART-TIME PROGRAMME

Stage 1		*Hours /Week*
Autumn Semester		
33101	Mathematics 1 (L/S))	3
62417	Chemistry 1 (L/S) (P/T) (2 Sem)	3
63112	Physics 1 (L/S) (P/T) (2 Sem)	3
91301	Biology 1 (P/T) (2 Sem)	3
Spring Semester		
33103	Statistics (L/S)	3
62417	Chemistry 1 (L/S) (P/T) (2 Sem)	3
63112	Physics 1 (L/S) (P/T) (2 Sem)	3
91301	Biology 1 (P/T) (2 Sem)	3
Stage 2		
Autumn Semester		
91312	Biology 2	6
91317	Human Biology	6
Spring Semester		
33105	Introductory Biometrics	3
62426	Chemistry 2 (L/S)	6
91395	Biocomputing	3
Stage 3		
Autumn Semester		
91313	Biochemistry 1	6
91314	Microbiology 1	6
Spring Semester		
91316	Bioinstrumentation	6
91330	Microbiology 2	6
	or	
91320	Biochemistry 2	6
Stage 4		
Autumn Semester		
91326	Analytical Biochemistry	6
91360	Quantitative Ecology	6
Spring Semester		
91362	Plant Ecophysiology	6
91363	Animal Ecophysiology	6
Stage 5		
Autumn Semester		
91364	Aquatic Ecology	6
	Plus	
*	Electives	3 or 6
Spring Semester		
91366	Pest Control and Toxicology	6
	Plus	
*	Electives	3 or 6

Stage 6		*Hours/Week*
Autumn Semester		
91365	Terrestrial Ecology	6
	Plus	
*	Electives	3
Spring Semester		
91367	Applied Ecology	6

TOTAL ELECTIVE HOURS TO BE COMPLETED - 15

	Plus	
*	Electives	6

* For details of the electives available for Environmental Biology see Elective Options Table.

NOTE
Students should note that excursions may be held in the week **prior to semester.**

URBAN HORTICULTURE DEGREE COURSE

The Bachelor of Applied Science - Urban Horticulture, is fully recognised for membership of the Australian Institute of Biology Inc., as a professional qualification in plant science and as a specialist qualification in ornamental and amenity, landscape and environmental horticulture. The course gives a scientific education in the basic sciences plus plant physiology, ecology, genetics and biogeography, soil science, biochemistry and microbiology. You also gain advanced technological skills in plant cultivation, protection, breeding and management. Excursions will be undertaken in the Sydney metropolitan area and to other parts of the State. Students should note that excursions may be held in the week **prior to semester.**

Employment Opportunities

Graduates of the course are in increasing demand as professional horticulturists. As an urban horticulturist you might be a researcher in a plant sciences laboratory, work on the selection and breeding of new ornamental varieties, including Australian native species, be responsible for the planning and management of nursery production, park and recreation areas, or the revegetation and management of natural areas disturbed by human impact. Many graduates also enter universities and research organizations.

Course Structure

You can complete the degree in three years full-time or six years part-time or a combination of both attendance patterns. The undergraduate programme emphasizes practical experimentation and research activities are encouraged through project assignments. The students acquire familiarity with advanced instruments and technology, and are encouraged to participate in seminar activities. The course has been developed in close liaison with all branches of the industry, and with the TAFE School of Horticulture, Ryde, whose glasshouse and associated facilities are used, in addition to those of UTS.

Subjects are divided into core subjects and 'elective' subjects. All students enrolled in the degree must satisfactorily complete all core subjects for award of the degree and, in addition, must satisfactorily complete a total of twelve hours of elective subjects. Students generally choose elective subjects with a particular theme or area of expertise in mind. Examples of recommended electives are given in Elective Options Table, however, it should be noted that timetable constraints may prevent the undertaking of some elective combinations.

Elective combinations include:

1 a particular area of study via subjects available from within the School of Biological and Biomedical Sciences
2 further study in areas of interest via subjects from other faculties of UTS
3 other individual elective sequences as may be approved by the Head of School, for example from another university.

FULL-TIME PROGRAMME

Stage 1		*Hours /Week*
Autumn Semester		
62416	Chemistry 1 (L/S)	6
91201	Horticultural Experimentation	3
91210	Landscape Horticulture	3
91216	Horticultural Procedures 1	6
91311	Biology 1	6
Stage 2		
Spring Semester		
62426	Chemistry 2 (L/S)	6
91217	Horticultural Procedures 2	6
91211	Horticultural Botany	3
91312	Biology 2	6
91395	Biocomputing	3
Stage 3		
Autumn Semester		
91206	Plant Production	6
91208	Plant Protection	6

		Hours/Week
91314	Microbiology 1	6
91360	Quantitative Ecology	6

Stage 4
Spring Semester

91204	Soils & Growth Media	6
91205	Plant Breeding & Genetics	6
91218	Australian Plants	6
91362	Plant Ecophysiology	6

Stage 5
Autumn Semester

91207	Plants in the Landscape	6
91229	Horticultural Management 1	3
91235	Special Horticultural Topics	3
91365	Terrestrial Ecology	6
	Plus	
*	Electives	6

Stage 6
Spring Semester

91215	Horticultural Research Project	6
91220	Horticultural Management 2	6

TOTAL ELECTIVE HOURS TO BE COMPLETED - 9

PART-TIME PROGRAMME

Stage 1		*Hours /Week*
Autumn Semester		
62417	Chemistry 1 (L/S) (P/T) (2 Sem)	3
91201	Horticultural Experimentation	3
91226	Horticultural Procedures 1 (2 Sem)*	3
91301	Biology 1 (P/T) (2 Sem)	3
Spring Semester		
62417	Chemistry 1 (L/S) (P/T) (2 Sem)	3
91226	Horticultural Procedures 1 (2 Sem)*	3
91301	Biology 1 (P/T) (2 Sem)	3
91395	Biocomputing	3

Year 2
Autumn Semester

91227	Horticultural Procedures 2 (2 Sem)*	3
91210	Landscape Horticulture	3
91312	Biology 2	6
Spring Semester		
62426	Chemistry 2 (L/S)	6
91211	Horticultural Botany	3
91227	Horticultural Procedures 2 (2 Sem)*	3

Year 3		*Hours/Week*
Autumn Semester		
91314	Microbiology 1	6
91206	Plant Production	6
Spring Semester		
91204	Soils & Growth Media	6
91205	Plant Breeding & Genetics	6

Year 4
Autumn Semester

91360	Quantitative Ecology	6
91208	Plant Protection	6
Spring Semester		
91362	Plant Ecophysiology	6
91218	Australian Plants	6

Year 5
Autumn Semester

91207	Plants in the Landscape	6
91365	Terrestrial Ecology	6
Spring Semester		
*	Electives	6

Year 6
Autumn Semester

91229	Horticultural Management 1	3
91235	Special Horticultural Topics	3
	Plus	
*	Electives	6
Spring Semester		
91220	Horticultural Management 2	6
91215	Horticultural Research Project	6

TOTAL ELECTIVE HOURS TO BE COMPLETED - 9

* For details of the electives available for Urban Horticulture see Elective Options Table.

NOTE

1. Entrants with TAFE Associate Diploma or Certificate in Horticulture or equivalent are exempted from some subjects and should enquire about exemptions at the time of enrolment.
2. Students should note that **excursions may be held in the week prior to semester.**

ELECTIVES TABLE FOR:
ENVIRONMENTAL BIOLOGY, BIOTECHNOLOGY and
URBAN HORTICULTURE COURSES

SUBJECT No	Name	Semester Hrs	A/S	MAJOR STRAND Environ Biology	Biotech	Urban Hort
62311	Geology	6	A	5		5
62443	Chemical Analysis 2	6	S	6		
62462	Environmental Chemistry	6	A	5		
77024	Environmental Law	3	A	5		5
91205	Plant Breeding & Genetics	6	S	5	6	—
91206	Plant Production	6	A	5		—
91207	Plants in the Landscape	6	A	5		—
91208	Plant Protection	6	A	5	5	—
91218	Australian Plants	6	S	6	6	—
91313	Biochemistry 1	6	A	—	—	5
91321	Biochemistry 3	6	A	5	5	
91322	Biochemistry 4	6	S	6	6	
91330	Microbiology 2	6	S	—	—	6
91331	Microbiology 3	6	A	5	—	
91337	Clinical Microbiology (Virology)	3	A		5	
91342	Clinical Biochemistry 1	3	A		5	
91346	Environmental Management Procedures	3	A	5		5
91347	Toxic Materials in the Environment	3	S	6		6
91350	Pharmacology & Toxicology	3	S	6	6	
91351	IImmunology 1	3	S		—	
91359	Immunology 2	6	S		6	
91363	Animal Ecophysiology	6	S	—	6	6
91364	Aquatic Ecology	6	A	—	—	5
91366	Pest Control & Toxicology	6	S	—	6	6
91368	Microbial Technology 1	6	A	5	—	
91369	Microbial Technology 2	6	S	6	—	
91372	Clinical Bacteriology & Parasitology	9	S	6	6	—
91373	Clinical & Applied Mycology	3	S	6	—	6
91374	Tissue Culture	3	A		5	
91396	Advanced Biocomputing	3	S	6	6	6
99995	General Studies Elective (ie. a subject from another School or Faculty)	3	A&S	5 or 6	5 or 6	5 or 6

KEY:

Hrs	=	Hours per week for that subject
A	=	Timetabled for Autumn Semester
S	=	Timetabled for Spring Semester
—	=	Core subject for that Course
5 or 6	=	Recommended Elective

NOTES:

1. Subjects marked 5 and 6 can be undertaken by Part Time students when programmable provided the prerequisite requirements are met
2. Due to timetabling constraints, not all electives may be available to all students in any given semester.
3. Subjects not marked may be able to be taken as electives following discussion with an appropriate member of Academic Staff.

BACHELOR OF APPLIED SCIENCE - HONOURS COURSE

Admission
The Honours course is open to students who possess, or have fulfilled all the requirements for a three-year Bachelors Degree in Biomedical Science, Biotechnology Environmental Biology or Urban Horticulture from the UTS or equivalent qualification, with an average credit grade in the final year of the undergraduate programme.

Aims
An Honours programme gives basic training in biological or biomedical research. Students may then enter occupations for which an Honours degree is the minimum entry requirement or continue with postgraduate research.

Attendance Patterns
The course is offered either as a full-time programme involving a nominal eighteen hours attendance per week over two semesters, or as a part-time programme involving a nominal nine hours attendance per week over four semesters. The first stage of the course contains course work partly devoted to research methodology, including experimental design, and partly to expanding the students' knowledge in areas other than those in which they are undertaking research. The research project, which is the major component of the course and extends over both semesters, normally takes the form of an experimental or analytical investigation, undertaken either in the laboratory or in the field. The work is in an area of biomedical science (biochemistry, immunology, pathology or microbiology), biotechnology or environmental biology and the results are presented in an oral seminar and in a written report, both of which are formally assessed.

Application
Prospective candidates should make an application to the Registrar by October 1, for entry to the Honours Degree programme in the first semester of the following year.

Selection
Applications for entry to the Honours Degree will be considered by the Honours Degree Committee of the School of Biological and Biomedical Sciences. Applicants will be notified of acceptance by the Registrar.

Commencement Date
Students are required to have commenced work on their Honours Program on or before the Monday of the first week in February .

Award
The Bachelor of Applied Science (Honours) will be awarded with the following grades: Class 1, Class 2 Division 1, Class 2 Division 2, and Class 3.

Further Information
Interested students should discuss the programme with Heads of Departments or with individual members of academic staff.

HONOURS COURSE PROGRAMME
FULL-TIME

Year1		*Hours /Week*
Autumn Semester		
91392	Research Methodology	3
91393	Reading Assignment/ Elective Coursework	6
91394	Project (Honours) (2 Sem)	9
Spring Semester		
91394	Project (Honours) (2 Sem)	18

PART-TIME

Year1		
Autumn Semester		
91392	Research Methodology	3
91393	Reading Assignment/ Elective Coursework	6
Spring Semester		
91384	Project (Honours) (3 Sem)	9
Year 2		
Autumn Semester		
91384	Project (Honours) (3 Sem)	9
Spring Semester		
91384	Project (Honours) (3 Sem)	9

POSTGRADUATE COURSES

General Information
The School offers PhD and Masters Degrees by thesis and Masters by course work and Graduate Certificate programmes on either a full-time or part-time basis. These programs cover both basic and applied biological science in an interdisciplinary environment. Brief outlines of the programmes are provided below. For further formal information, consult the general rules for postgraduate degree programmes, plus individual brochures available from the School upon request.

Postgraduate Degree-Attendance Modes available

Doctoral Programme

Full-Time	Part Time
Full-Time	Part Time with * External Supervision

Masters By Thesis

Full-Time	Part Time
Full-Time	Part Time with * External Supervision

* See External supervision information below

Masters by Coursework

Clinical Biochemistry		Part Time
Clinical Measurement	Full-Time	Part Time
Environmental Toxicology	Full-Time	Part Time
Medical Physics	Full-Time	Part Time

External Supervision
Students applying for part-time study mode with external supervision are required to show, prior to enrolment, that appropriate supervision, research support and facilities are available. These requirements are in addition to the normal requirement of internal supervision of an agreed upon research topic.

Fees and Higher Education Contribution Scheme
Higher Education Contribution Scheme [HECS] will normally apply to all students enrolled in postgraduate courses. At the discretion of the Vice-Chancellor, HECS Scholarships have, in recent years, been granted to students enrolled in postgraduate research degrees. Postgraduate students are required to pay the compulsory student charges of $191 for new students and $171 for continuing students, on enrolment.

Postgraduate Scholarships
A number of scholarships are available to postgraduate students undertaking Masters and Doctoral programs both by Coursework and Research. The Department of Employment, Education and Training [DEET], currently funds Research, Coursework and Overseas Research postgraduate awards. Information regarding eligibility criteria and how to apply for these scholarships, is available from Graduate Studies Department, Broadway Campus of UTS. Closing dates for these scholarships have, in recent years, been in late September/October of the year prior to award.

POSTGRADUATE DEGREES BY RESEARCH / THESIS

The Masters and Doctoral programs are designed for graduates who wish to develop a career in the field of Biological and Biomedical Science by undertaking an appropriate research investigation under professional supervision.
The broad areas of research expertise within the school are:

- cell and molecular biology, including microbiological, biochemical and immunological specialisations.
- biomedical instrumentation and computing
- medical biochemistry and microbiology
- environmental science
- amenity and landscape horticulture

Applications are invited for these research programs. Please consult with a potential academic supervisor or appropriate Head of Department prior to submission of an application.

MASTERS DEGREE BY THESIS

The course can be completed in two years of full-time study or over a minimum of three years part-time. Study can be carried out by means of a co-operative arrangement with the candidate's employer.

Admission requirements:

(a) a bachelor's degree of UTS;
OR
(b) an equivalent qualification;
OR
(c) other general or professional qualifications as will satisfy the Academic Board that the applicant possesses the educational preparation and capacity to successfully complete

PhD PROGRAMME

The Ph D or Doctoral programme is normally a minimum of three years duration on a part-time basis and two years duration on a full-time basis if applicants hold a Masters degree, or four years part-time, and three years full-time for applicants with a Bachelor's degree.

Admission requirements:

(a) an Honours degree of UTS,
OR
(b) a Masters degree of UTS,
OR
(c) an equivalent qualification.

MASTERS DEGREES BY COURSEWORK

Master of Applied Science
Clinical Biochemistry

Master of Applied Science
Clinical Measurement

Master of Applied Science
Medical Physics

Master of Applied Science
Environmental Toxicology

Master of Applied Science
Coastal Resource Management *

* an interdisciplinary course run by the Faculty of Science in collaboration with the Faculties of Engineering, Business, Law, and Design, Building & Architecture.

Admission Requirements and Selection

As laid down under the University "General Rules for Masters Degrees by Course Work" candidates may be admitted to the course with either:

(a) a bachelor's degree of UTS;
OR
(b) an equivalent qualification;
OR
(c) other general or professional qualifications as will satisfy the Academic Board that the applicant possesses the educational preparation and capacity.

Requirements for Subject Assessment and Student Progression

Students enrolled for Masters Degree by Coursework shall have each subject assessed according to the normal rules of this University. However, there is no allowance for conceded pass and Weighted Average Mark will not be calculated.

A student who fails in any two subjects, or any one subject twice, or who fails to submit their Project Report at the specified time, will be seen as making unsatisfactory progress and will have their registration discontinued. Students may appeal against such discontinuation of registration.

MASTERS DEGREE IN CLINICAL BIOCHEMISTRY

The course is available to science and medical graduates with a good background in general biochemistry and is designed mainly for those working in clinical laboratories. It extends their knowledge and professional expertise in the discipline of clinical biochemistry and in the efficient operation of a clinical laboratory. The course also provides an opportunity for research training in clinical biochemistry.

Admission to the course will be limited and the selection process may involve personal interviews. Concurrent employment in a clinical biochemistry laboratory or related area is a normal requirement for admission.

The course is offered on a part-time basis over six semesters, normally involving attendance at the UTS for nine hours per week. The programme of study consists of formal lectures, discussion groups, laboratory sessions, seminars and a supervised research project. In the early stages of the course, students are introduced to analytical aspects of biochemistry and to fundamental areas of clinical biochemistry. Other subjects include the use of computing in the biological and medical sciences, aspects of laboratory management, the statistical analysis of data and experimental design. Later stages of the course focus on more advanced areas of clinical biochemistry and include case study analysis and the development of problem solving and consulting skills.

The final third of the course is devoted to a research project involving investigatory or developmental work in an appropriate area of clinical biochemistry. Projects are undertaken in co-operation with the employing laboratories and the results of the work are presented in an oral seminar and in a written report prepared in

accordance with the formal requirements laid down by the School.

Students who have already demonstrated their competence in any of the foundation subjects may be offered alternative subjects of equivalent length.

MASTERS DEGREE IN CLINICAL BIOCHEMISTRY

PART-TIME PROGRAMME ONLY

Year 1		*Hours/Week*
Autumn Semester		
91326	Analytical Biochemistry *	6
91342	Clinical Biochemistry 1	3
Spring Semester		
91343	Clinical Biochemistry 2	3
91423	Clinical Biochemistry -Advanced Aspects A *	6
Year 2		
Autumn Semester		
91408	Principles of Biocomputing *	3
91417	Clinical Laboratory Management *	3
91433	Biostatistics *	3
Spring Semester		
91424	Clinical Biochemistry - Advanced Aspects B *	6
91453	Project (Clinical Biochemistry)	3
Year 3		
Autumn Semester		
91419	Case Studies in Clinical Biochemistry*	3
91456	Project (Clinical Biochemistry)	6
Spring Semester		
91459	Project (Clinical Biochemistry)	9

* Some subjects are offered in alternate years only so students enrolling in 'odd' and 'even' years undertake these subjects in reverse order.

MASTERS DEGREE IN CLINICAL MEASUREMENT

The course offers postgraduate education to graduates in physical or biological science wishing to enter careers in clinical measurement, biomedical engineering and related areas of hospital and medical science such as cardiology, respiratory physiology, neurophysiology, biochemistry and orthopaedics.

The programme can be completed in two years full-time or in three years of part-time attendance. The part-time pattern normally involves nine hours per week for six semesters. In the first semester most students undertake two appropriate foundation subjects. In the next three semesters six advanced subjects are offered, covering essential knowledge and skills in the area of clinical measurement. The formal course work comprises lectures, tutorials and supervised laboratory work, some of which may be conducted at teaching hospitals in Sydney. Students will undertake assignments and complete formal examinations. In the final year students undertake a project in an applied field relevant to their interests.

In the full-time attendance pattern the student must complete the requirements of the degree in two years.

Admission to the course is open to science, engineering and medical graduates of universities and colleges of advanced education, or persons with equivalent qualifications. Basic human anatomy and physiology, or basic electronics and computer programming and mathematics, are normally pre-requisites. Foundation subjects are available to those who need extra background in either of these areas.

MASTERS DEGREE IN CLINICAL MEASUREMENT

PROGRAMME OF STUDY PART-TIME

Year 1		*Hours/Week*
Autumn Semester		
91405	Bioelectronics	3
91408	Principles of Biocomputing	3
91436	Advanced Mathematics in Life Sciences	3
	or	
91420	Principles of Bioscience	3
91421	Principles of Human Biology	6

Spring Semester *		*Hours/Week*
91437	Advanced Bioinstrumentation	3
91438	Biosensors and Transducers	3
91439	Physiological Measurement	3

Year 2

Autumn Semester		
91462	Medical Imaging and Signal Processing	3
91461	Physiological Modelling	3
91433	Biostatistics	3

Spring Semester *		
91463	Hardware for Clinical Data Acquisition & Control	3
91464	Laboratory Biocomputing	3
91465	Advanced Programming	3

Year 3

Autumn Semester		
91407	Project - Clinical Measurement	9

Spring Semester		
91407	Project - Clinical Measurement	9

* Sets of Spring Semester subjects alternate each year, which means entrants in odd and even years will undertake slightly different programs.

NOTES:

1. Subjects will be prescribed in the first semester according to the educational background of the entrant.
2. Each semester normally consists of a 9 semester hours per week, study load.
3. Full-time students must complete the requirements of the degree in two years by enrolling in 91406 Project 4.4 Hrs., in each semester.
4. A minimum of 54 semester hours must be successfully completed for award of the degree.

MASTERS DEGREE IN COASTAL RESOURCE MANAGEMENT

This degree in Coastal Resource Management, for introduction in 1992, is a joint enterprise of the Faculties of Science, Engineering and Business, in collaboration with the Faculties of Law, and Design, Architecture and Building. The course can be completed over three years of part-time study, normally involving attendance on one afternoon and two evenings per week. Associated short-courses, based on the various subject modules, and a two year full-time option for the Masters course will soon be available.

The course is part of the UTS Coastal Resource Management Programme, the aims of which are to:

- offer interdisciplinary professional courses for work in industry and government
- conduct the research needed to improve the management of coastal resources
- collaborate with industry and government in identifying areas of concern
- provide consultancy and information resources to industry and government
- help provide effective solutions to the complex problems of this area of study
- enhance community awareness and education in this area
- develop a centre of expertise in the Pacific region.

The course will enable you to enter or develop a career in coastal resource management in commerce, industry, consultancy, or with government agencies,.as one of the new generation of environmental managers with:

- an understanding of ecological processes
- an ability to assess the possible impacts of planned actions on coastal and marine environments
- a willingness and ability to monitor and reduce the impacts of those actions
- the professional skills to work in integrated teams for environmental problem-solving, planning and management
- an ability to manage coastal resources in developing and developed

The course includes field work, site inspections, laboratory procedures and a variety of desk studies. In the final semester you will select and undertake an individual research project, in consultation with an appropriate academic supervisor, in your own area of interest and expertise. Your project may be completed on campus or in association with an employer agency. The course equips you as an environmental manager who, as part of a team, can take responsibility for decision making and conflict resolution with respect to coastal resources.

Admission to the course is open to graduates in Science, Engineering, Architecture, Building, Business, Law, or equivalent background. Applicants with general or professional qualifications which satisfy the Academic Board of capacity to pursue graduate studies, may also qualify for admission. Entrants may be eligible for exemptions from one or more of the foundation subjects, on the basis of prior qualifications.

MASTERS DEGREE IN COASTAL RESOURCE MANAGEMENT

PROGRAMME OF STUDY PART-TIME

Year 1		*Hours/Week*
Autumn Semester		
98901	Coastal Resource Management 1	3
Plus any three of:		
98601	Coastal Geology	3
98902	Biological Systems	3
98602	Coastal Environmental Chemistry	3
98401	Estuarine and Coastal Hydraulics	3
Spring Semester		
98701	Law and Coastal Resources	3
98903	Experimental Design and Resource Management	3
98201	Environmental Economics and Ecologically Sustainable Development	3
Year 2		
Autumn Semester		
98904	Coastal Biological Resources	3
98603	Geological Resources and Development in Coastal Regions	3
98905	Resource Measurement and Assessment	3
Spring Semester		
98906	Coastal Resource Management 2	3
98202	Coastal Planning and Development	3
98907	Pollution Assessment and Monitoring	3
Year 3		
Autumn Semester		
98203	Coastal Management and Administration	3
98204	Coastal Tourism, Recreation and Natural Systems Management	3
98908	Integrated Environmental Assessment and Management	3
Spring Semester		
98990	Individual Research Project in Coastal Resource Management	9

For further information contact:

The Project Co-ordinator, Coastal Resource Management, C/o School of Biological and Biomedical Sciences. Phone: (02) 330-4044.

MASTERS DEGREE IN ENVIRONMENTAL TOXICOLOGY

Environmental toxicology is the science which deals with the toxicity of chemicals in the environment to organisms, communities and ecosystems. A wide range of chemicals is in current use and their toxic effects need to be monitored. New chemicals are constantly being introduced and toxicological data are needed to assess potential hazard.

The course provides relevant postgraduate education and training in the developing science of environmental toxicology and is offered in conjunction with the Centre for Environmental Toxicology. This Centre is a joint initiative between the State Pollution Control Commission and the University of Technology, Sydney, and is housed in the School of Biological and Biomedical Sciences.

Admission to the course is open to graduates in the biological sciences, chemistry, agriculture, pharmacy, engineering or equivalent degrees. Admission to the course will be limited and the selection process may involve personal interviews.

The course is offered on a full-time or part-time basis. The part-time programme normally involves attendance for nine hours per week for a total of six semesters. In the first two years there are eight formal courses which cover the essential knowledge and skills for the practising environmental toxicologist. The formal course work comprises lectures, tutorials and supervised laboratory work. Students will undertake written assignments and formal examinations. The final year involves a project which enables students to apply their knowledge to problems in environmental toxicology through experimental investigation, extensive critical reviews or other suitable activities. Projects may be undertaken in conjunction with industry or government institutions. All students must complete a report based on the project undertaken. The report must be prepared in accordance with the formal requirements laid down in the UTS Rules.

In the full-time attendance pattern students must complete the requirements of the degree in two years.

Objectives

The objectives of the course are to train scientific personnel to:

1. be familiar with the groups of environmentally hazardous chemicals and their biochemical and environmental effects;

2. design and implement toxicological tests on a variety of organisms including invertebrates, fish, mammals, terrestrial and aquatic plants;
3. analyse and interpret the results of toxicological tests;
4. use techniques of analytical chemistry to determine the nature and level of toxic materials in the environment;
5. conduct field surveillance for the effects of toxic substances;
6. assess the risk from toxic chemicals and advise on environmentally sound management procedures.

MASTERS DEGREE IN ENVIRONMENTAL TOXICOLOGY

PROGRAMME OF STUDY PART-TIME

Year 1		*Hours/Week*
Autumn Semester		
91448	Introduction to Toxicology	6
91449	Experimental Design	3
Spring Semester *		
91442	Toxicological Testing - Bioassay	6
91443	Environmental Management	3
Year 2		
Autumn Semester		
91444	Analytical Techniques in Toxicology	6
91445	Biochemical Toxicology	3
Spring Semester *		
91446	Field Surveillance & Management of Toxic Subs.	6
91447	Environmental. Accumulation & Transformation of Toxic Substances	3
Year 3		
Autumn Semester		
91450	Project - Environmental Toxicology	9
Spring Semester		
91450	Project - Environmental Toxicology	9

* Sets of Spring Semester subjects alternate each year, which means entrants in odd and even years will undertake slightly different programmes.

PROGRAMME OF STUDY FULL-TIME

Full-time students must complete the requirements of the degree in two years by enrolling in 91460 Project - 4.5 Hrs., in each of the first four semesters. All other subjects are as outlined above for Part-time programme.

MASTERS DEGREE IN MEDICAL PHYSICS

The course offers postgraduate education to graduates in the physical sciences wishing to enter a career in medical physics or related areas of hospital and medical science, such as nuclear medicine, radiotherapy, radiology or radiation protection. It is being offered by the school, with support from the Australian Nuclear Science and Technology Organisation (ANSTO), members from the Australian College of Physical Scientists and Engineers in Medicine (ACPSEM) and major teaching hospitals.

The programme can be completed in two years full-time or in three years of part-time attendance. The part-time pattern normally involves nine hours per week for six semesters. In the first semester most students undertake two appropriate foundation subjects. In the next three semesters six advanced subjects are offered, covering essential knowledge and skills in the area of clinical measurement. The formal course work comprises lectures, tutorials and supervised laboratory work, some of which may be conducted at teaching hospitals in Sydney. Students will undertake assignments and complete formal examinations. In the final year students undertake a project in an applied field relevant to their interests.

In the full-time attendance pattern the student must complete the requirements of the degree in two years.

Admission to the course is open to physical science graduates of universities and colleges of advanced education, or persons with equivalent qualifications. Basic human anatomy and physiology, or basic electronics, computer programming and mathematics, are normally pre–requisites. Foundation subjects are available to those who need extra background in either of these areas.

Objectives

The objectives of the course are to provide students with:

1. specialist knowledge in the field of medical physics;
2. comprehensive theoretical and practical education in computer hardware and software in clinical and physiological data acquisition;

3. extensive range of biomathematical, biostatistical, signal processing and image processing skills;
4. grounding in the complex physiological processes of the body;
5. skills to conduct and report on an extensive research project;
6. ability to work as an independent, analytical professional in the medical physics environment.

MASTERS DEGREE IN MEDICAL PHYSICS

PROGRAMME OF STUDY PART-TIME

Year 1		*Hours/Week*
AutumnSemester		
91405	Bioelectronics	3
91408	Principles of Biocomputing	3
91436	Advanced Mathematics in Life Sciences	3
	or	
91420	Principles of Bioscience	3
91421	Principles of Human Biology	6
Spring Semester *		
91434	Radiation Protection	3
91403	Physics in Medicine 1	3
91404	Physics in Medicine 2	3
Year 2		
Autumn Semester		
91462	Medical Imaging and Signal Processing	3
91461	Physiological Modelling	3
91433	Biostatistics or	3
Spring Semester *		
91463	Hardware for Clinical Data Acquisition & Control	3
91464	Laboratory Biocomputing	3
91465	Advanced Programming	3
Year 3		
Autumn Semester		
91489	Project - Medical Physics	9
Spring Semester		
91489	Project - Medical Physics	9

* Sets of Spring Semester subjects alternate each year, which means entrants in odd and even years will undertake slightly different programmes.

NOTES:
1. Subjects will be prescribed in the first semester according to the educational background of the entrant.
2. Each semester normally consists of a 9 semester hours per week, study load.
3. Full-time students must complete the requirements of the degree in two years by enrolling in 91484 Project 4.4 Hrs., in each semester.
4. A minimum of 54 semester hours must be successfully completed for award of the degree.

GRADUATE CERTIFICATES

Graduate Certificates will normally consist of three subjects offered over one semester for nine hours per week. Offered at the postgraduate level, they allow professionals to undertake a specific group of work related subjects in order to enhance their knowledge in the rapidly expanding field of science and technology.

GRADUATE CERTIFICATES IN BIOMEDICAL TECHNOLOGY

Graduate Certificates in Biomedical Technology are specifically designed as intensive training programmes for professionals working in the areas of medical instrumentation and clinical measurement.

Admission Requirements

Graduate Certificate courses are offered to graduates from the physical or biological sciences, engineering or medicine, with appropriate prerequisites.

Graduate Certificates
Autumn Semester - available every year
Data Processing and Management in the Life Sciences
Electronics and Computing in the Life Sciences
Human Biology

Graduate Certificates
Spring Semester - 1992 and even years only
Medical Instrumentation and Measurement
Physics in Medicine

Spring Semester - 1993 and odd years only
Computer Data Acquisition in the Life Sciences

Course Fees

Course fees will apply. Postgraduate students are required to pay the Student Service Charge on enrolment.

Attendance

Each Graduate Certificate Course requires attendance of nine hours per week for one semester only.

Graduate Certificate Courses in Biomediccal Technology will be offered in either Autumn or Spring semester and some will be offered in alternate years only.

Graduate Certificates in Biomedical Technology

COMPUTER DATA ACQUISITION IN THE LIFE SCIENCES

This certificate is designed to give comprehensive theoretical and practical education in computer hardware and software used in the area of clinical and physiological data acquisition. The programme will provide the participant with knowledge and tools to set up and operate the digital acquisition and processing section of a data acquisition laboratory in a physiological setting.

Spring Semester		*Hours/Week*
91463	Hardware for Clinical Data Acquisition & Control	3
91464	Laboratory Biocomputing	3
91465	Advanced Programming	3

DATA PROCESSING AND MANAGEMENT IN THE LIFE SCIENCES

This certificate is designed to provide students with an extensive range of mathematical, statistical, signal processing and image processing skills. These are directly applicable to the analysis of biological systems, diagnostic images, physiological signals and related areas of data processing and analysis in the life sciences.

Autumn Semester		*Hours/Week*
91462	Medical Imaging and Signal Processing	3
91461	Physiological Modelling	3
91433	Biostatistics	3

ELECTRONICS AND COMPUTING IN THE LIFE SCIENCES

This certificate is designed to give a foundation education in analogue and digital electronics, accompanied by a suitable treatment of mathematical concepts, and in computer programming as applied to the life sciences. It is suitable for health professionals wishing to enter fields of biomedical instrumentation, clinical measurement and other related fields.

Autumn Semester		*Hours/Week*
91405	Bioelectronics	3
91408	Principles of Biocomputing	3
91436	Advanced Mathematics in Life Sciences	3

HUMAN BIOLOGY

This certificate is designed to give a foundation education in biological processes, and in particular, a study of the various physiological processes of the human body. The certificate is suited to scientists and engineers who are in the areas of biomedical engineering, medical physics or related fields, and wish to branch into biological applications.

Autumn Semester		*Hours/Week*
91420	Principles of Bioscience	3
91421	Principles of Human Biology	6

MEDICAL INSTRUMENTATION AND MEASUREMENT

This certificate is designed to give comprehensive theoretical and practical education in the techniques to monitor and measure physiological parameters. Advanced instrumentation techniques, sensors and transducers used in physiological monitoring are taught in this course. The physical principles used to explain the operation and interaction of the physiological behaviour and the measurement techniques are also covered.

Spring Semester		*Hours/Week*
91437	Advanced Bioinstrumentation	3
91438	Biosensors and Transducers	3
91439	Physiological Measurement	3

PHYSICS IN MEDICINE

This course is designed for professionals in the area of medical physics, radiation protection, organ imaging and other related fields. Extensive theoretical and practical work is carried out in the hospital setting and at the Australian Nuclear Science and Technology Organisation.

Spring Semester		*Hours/Week*
91434	Radiation Protection	3
91403	Physics in Medicine 1	3
91404	Physics in Medicine 2	3

SYNOPSES

Subject descriptions are listed in numerical order.

SUBJECTS OFFERED BY OTHER FACULTIES

GENERAL STUDIES ELECTIVE SUBJECT - 3 HRS

Various subjects are available from other Faculties
Request information from the Information Officer, or equivalent, in each Faculty, or from the School Student Administration Unit, Dunbar Building, St. Leonards Campus.

SCHOOL OF MATHEMATICAL SCIENCES

33101 MATHEMATICS 1 (Life Sciences)

Three semester hours (1 s/hr lecture, 2 s/hrs workshop).

Aspects of measurement; sequences and series; convergence and limits; graphical representation of linear and non-linear relationships; sigmoid curve; differentiation; integration; introduction to differential equations; trigonometric functions. All topics are illustrated by problems relevant to biology.

33103 STATISTICS (Life Sciences)

Three semester hours (2 s/hrs lectures, 1 s/hr tutorial).

Descriptive statistics; measures of central tendency and dispersion; probability; discrete distributions including binomial, Poisson; continuous distributions including uniform, Normal; simple random sampling; standard tests of significance and estimation for population means and variances; goodness of fit tests.

33105 INTRODUCTORY BIOMETRICS

Three semester hours (1 s/hr lecture, 2 s/hrs workshop).
Prerequisite: Statistics (Life Sciences) (33103).

Design and analysis of biological experiments; completely randomized design; randomized block design; regression analysis and correlation; multiple and polynomial regression; latin square design; two factor designs with interaction; distribution free tests.

FACULTY OF SCIENCE
SCHOOL OF PHYSICAL SCIENCES

62416 CHEMISTRY 1 (Life Sciences) (F/T) (1 Sem)

Six semester hours (2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical).
Prerequisite: HSC Science or equivalent.

Chemistry as it is related to the Life Sciences. Basic concepts, atomic structure, periodic table, bonding, stoichiometry, thermodynamics, structure of matter.

62417 CHEMISTRY 1 (Life Sciences) (P/T) (2 Sem)

Three semester hours for two semesters
Equivalent to 62416 above.

62426 CHEMISTRY 2 (Life Sciences)

Six semester hours (3 s/hrs lectures, 3 s/hrs practical).
Prerequisite: Chemistry 1 (L/S) (62416/62417).

Introduction to organic chemistry; functional groups; mechanism of reactions; stereochemistry. Reaction Kinetics; chemical equilibrium; acids and bases; solubility.

63111 PHYSICS (Life Sciences) (F/T) (1 Sem)

Six semester hours (3 s/hrs lectures, 1/2 s/hr tutorial 2.5 s/hrs practical).
Prerequisite: HSC Mathematics and Science or equivalent.
Corequisite: Mathematics 1 (L/S) (33101).

General introduction to mechanics, wave motion, optics, thermal physics, properties of matter and modern physics.

63112 PHYSICS (Life Sciences) (P/T) (2 Sem)

One point two five semester hours lecture for two semesters. Either one hour tutorial or 2.5 hours practical.
Equivalent to 63111 Full-time above.

FACULTY OF SCIENCE
SCHOOL OF BIOLOGICAL AND BIOMEDICAL SCIENCES

91201 HORTICULTURAL EXPERIMENTATION

Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisites: Nil.

Deals with the principles of biological experimentation, as applied to horticulture. These include uses of simple mathematical functions; experimental design and analysis; the use of statistics; and applications in practical situations such as testing growth media, pesticides, or plant performance.

91204 SOILS AND GROWTH MEDIA

Six semester hours (2 hrs lecture, 4 s/hrs practical tutorial).
Prerequisites: Chemistry 1 (62417), Biology 1 (91311) or Concepts in Biology (91378).

Physical and chemical properties of soils and horticultural potting mixtures; methods of analysis; supply of nutrients, water, air, ions; management of soils and potting mixes. Problems with soils and mixes; pH, drainage, irrigation and salinity. Natural Australian soil ecosystems; growth media, formulation and use; media used in hydroponics.

91205 PLANT BREEDING AND GENETICS

Six semester hours (2 s/hrs lecture, 4 s/hrs practical, tutorial).
Prerequisite: Biology 1 (91311) or Concepts in Biology (91388) plus Microbiology 1 (91314).

Plant cell processes including molecular genetics and control of genetic activity in cells and environmental influences amongst individuals and populations. Plant tissue culture - principles and practices, and application of these by cloning, micropropagation, somatic cell genetics and hybridisation.

91206 PLANT PRODUCTION

Six semester hours (2 s/hrs lecture, 4 s/hrs practical, tutorial).
Prerequisite: Biology 2 (91312).

Cultivation of both exotic and native plants of value in urban horticulture. Skills necessary for the cultivation, selection and modification of stocks for particular situations are developed. The principles of plant physiology, water use, irrigation and associated problems, with nursery and intensive cultivation systems.

91207 PLANTS IN THE LANDSCAPE

Six semester hours (2 s/hrs lecture, 4 s/hrs practical/ tutorial).
Prerequisites: Plant Production (91206).

Explores in depth the uses of plant materials, particularly Australian natives, as part of the function of open space management. The subject deals with site evaluation, design principles, human needs and the uses and benefits of plants in the landscape. Also considered are principles of plant selection and the cultural practices necessary to establish plants at the site and maintain their health.

91208 PLANT PROTECTION

Six semester hours (2 hrs lecture, 4 s/hrs practical/ tutorial).
Pre-equisites: Horticultural Science 1 (91202), Microbiology 1 (91314).

Advances an understanding of plant pests and disease, their transmission and control. The subject deals with major groups of plant pests, the safe handling of herbicides and other control substances, and biological control approaches.

91210 LANDSCAPE HORTICULTURE

Three semester hours (2s/hrs lecture, 1/sh practical/ tutorial)
Prerequisites: Biology 1 (91311) or Concepts in Biology (91378)

Provides an overview of landscape studies by considering the significance and inter-relationships of horticulture and human societies - past, present and future. The subject includes the history and process of landscape design, and looks at case studies in the Sydney region.

91211 HORTICULTURAL BOTANY

Three semester hours (1s/hrs lecture, 2/sh practical)
Co or Prerequisites: Biology 1 (91311) or Concepts in Biology (91378)

The biological principles involved in the horticultural use of plant materials. Plant structure and function. Plant development.

91215 HORTICULTURAL RESEARCH PROJECT

Six semester hours (2 s/hrs, 4 s/hrs practical/tutorial).
Corequisite: Horticultural Management 2 (91220).

Students, individually or in groups of two or three, are required to carry out a research or development project, related to personal interest or their employment

situation. Each student is required to present a report of this work, which is lodged with the School's report collection.

91216 HORTICULTURAL PROCEDURES 1 (1 Sem)
Six semester hours.

Introduction to urban horticulture, indicating its historical and cultural significance. Major world climate zones and the species and typical structural forms of vegetation. Plant features utilised in ornamental horticulture for a variety of amenity and aesthetic purposes. Annual, perennial, herbaceous, woody, exotic and native plant species for specific purposes. Plant nomenclature, and identification of selected groups. Techniques of propagation from seeds, spores, cuttings. Budding, grafting and pruning techniques. Applications of a range of construction materials and equipment to open area establishment and planting; simple surveying and levelling techniques and introduction to recording and monitoring programme.

91217 HORTICULTURAL PROCEDURES 2 (1 Sem)
Six semester hours.
Prerequisite: Horticultural Procedures 1 (91216).

The role of selected woody ornamentals, bulbs, and soft-wooded perennials in their natural ecosystems, and in the artificial environments of urban landscapes. The distribution of native vegetation in the Australian environment, and the choice of plants, exotic and native, for particular places and uses. Methods of plant identification. The asexual propagation of the plant material including breeding, aerial layering, semi-hardwood cuttings, grafting, introduction of leaf cuttings, tissue culture, and cultivation of plants in controlled nursery environments. An introduction to the problems presented by different horticultural sites, and techniques of landscape construction, including drainage, postings, retention banks, and access ways.

91218 AUSTRALIAN PLANTS
Six semester hours (2 s/hrs lectures, 4 s/hrs practical/tutorial).
Prerequisite: Quantitative Ecology (91360)

The taxonomy, identification, distribution natural ecology and biogeography of Australian plants. The potential of native plants for horticultural exploitation. Cultivation techniques for native species.

91220 HORTICULTURAL MANAGEMENT 2
Six semester hours (2 s/hrs, 4 s/hrs practical/tutorial).
Prerequisite: Horticultural Management 1 (91219).

(Organisational): A systems approach to the operation of horticultural enterprises including nurseries and public areas such as parks and gardens, are developed. The subject includes an investigation of methods of formulating management options in terms of production, personnel, publicity and marketing in a nursery enterprise; and of resolutions of conflicts of human uses and of public utility and private rights, in the management of open areas. The utilisation of information sources, and legal aspects of management and marketing will also be considered.

91226 HORTICULTURAL PROCEDURES 1 (2 Sem)
Three semester hours for two semesters.
Equivalent to 91216 above.

91227 HORTICULTURAL PROCEDURES 2 (2 Sem)
Three semester hours for two semesters.
Equivalent to 91217 above.

91229 HORTICULTURAL MANAGEMENT 1
Three semester hours (1 s/hrs lecture, 2 s/hrs practical/tutorial).
Prerequisites: Satisfactory completion of stages 1 to 4 of the course (stages 1 to 3 for entrants with Assoc Diploma in Horticulture or equivalent)

Principles and practices of business management in a horticultural enterprise. Introduction to accounting methods, balance sheets, stock control, management and legal issues. Production management and open space management.

Strand B - Technical
Greenhouse system design and operation, and seasonal and commercial factors in production management. Design, construction and maintenance of open spaces for a variety of purposes; seasonal and budgetary management.

91235 SPECIAL HORTICULTURAL TOPICS
Three semester hours (1 s/hrs lecture, 2 s/hrs practical/tutorial).
Preequisites: Satisfactory completion of stages 1 to 4 of the course (stages 1 to 3 for entrants with Assoc Diploma in Horticulture or equivalent)

Develops and extends specialised knowledge of selected areas. The subject is also designed to introduce

students to a number of areas with potential for development and application in horticulture.

91297 PROFESSIONAL EXPERIENCE (Urban Horticulture) (6 Hrs) F/T
Six semester hours for two semesters.

One year (48 weeks) of relevant work experience is required for the completion of the degree in Urban Horticulture. Each student must enrol in this subject for a total of twelve semester hours. Four weeks of full-time work is equivalent to one semester hour. Work experience can be completed concurrently with part-time studies, or as a sandwich year, usually taken between the second and final years of the course. This subject number is for sandwich students.

91299 PROFESSIONAL EXPERIENCE (Urban Horticulture) (3 Hrs) P/T
Three semester hours for four semesters.

See 91297 for description. This subject number is for students enrolled in the part-time degree programme.

91301 BIOLOGY 1 (P/T) (2 Sem)
Three semester hours for two semesters.
Equivalent to 91311 below.

91311 BIOLOGY 1 (F/T) (1 Sem)
Six semester hours (2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical).

Diversity of living things: cell theory and use of knowledge of cell structure to distinguish kingdoms of organisms; comparative morphology and systems physiology in major phyla of the animal kingdom.

91312 BIOLOGY 2
Six semester hours (2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical).
Prerequisite: Biology 1 (91311) or equivalent.

Organisation and control at cell level; functioning of membranes and organelles, enzymes and other proteins; the dependence of protein synthesis on genetic coding from DNA, applications to genetic engineering. Organisation and control in organisms and populations; principles of genetics, and interactions of genes and environment. Organisation and control in terrestrial ecosystems. Structure and function of angiosperms as major primary producers in terrestrial ecosystems. The interaction of biotic and abiotic factors in ecosystems. The cycling of nutrients and flow of energy. Examples of Australian ecosystems. Adaptations of vegetation to the Australian environment.

91313 BIOCHEMISTRY 1
Six semester hours (2 s/hrs lectures, 1 s/hr tutorial 3 s/hrs practical).
Prerequisites: Biology 2 (91312) or equivalent. Chemistry 2 (Life Sciences) (62426)

Bioenergetics and physical biochemistry: energy flow and transformation, laws of thermodynamics, free energy considerations in equilibrium and steady-state situations; electrolyte behaviour, pH and proton equilibria; colligative properties, osmotic pressure; chemical kinetics, catalysis and enzyme action. Structure and function of biological molecules emphasizing structural, energy providing and informational characteristics: carbohydrates, lipids, amino acids, peptides, proteins (including enzymes), necleosides, nucleotides, nucleic acids. Replication and repair of DNA; recombinant DNA. Protein synthesis. Basic concepts of metabolic pathways; energetics of metabolism.

91314 MICROBIOLOGY 1
Six semester hours (2 s/hrs lectures, 4 s/hrs practical).
Prerequisite: Biology 2 (91312) or Concepts in Biology (91378).

An introduction to the structure, function and taxonomy of the bacteria, fungi, protozoa and viruses. A survey of selected topics including microscopy; elementary immunology; chemotherapy; microbial ecology; sterilisation and disinfection and microbiological techniques.

91315 BIOMONITORING
Three semester hours
Prerequisites: Biology 2 (91312); Human Biology (91317)
Corequisite: Microbiology 1 (91314)

The dynamics of natural and disturbed aquatic and terrestrial ecosystems; effects of industrial pollution on these ecosystems will be investigated. Effects of pollution include chemical changes such as pH fluctuations, increases in concentrations of heavy metals and organic chemicals such as pesticides and detergents; biological contaminants resulting from sewerage, garbage and changes in the balance of the natural microorganisms biota. Sampling procedures; estimates of biomass and productivity; methods of data analysis. This subject includes compulsory field excursions.

91316 BIOINSTRUMENTATION
Six semester hours (3 s/hrs lectures, 3 s/hrs practical).
Prerequisite: Physics (Life Sciences) (63111).

Concepts of electricity, electronic and computerised instrumentation, transducers, signal processors, record-

ing and display equipment. Application of instrumentation in the measurement of clinical and biological parameters.

91317 HUMAN BIOLOGY
Six semester hours (3 s/hrs lectures, 3 s/hrs tutorial/practical).
Corequisite: Biology 2 (91312).

Basic gross anatomy and detailed study of microscope structure of the human body. The structure and function of tissues and organs are related to a model of control mechanism in order to emphasise the process of homeostasis. Whenever possible, an attempt is made to integrate morphological, physiological and biochemical details in each of the functional units in the human body.

91320 BIOCHEMISTRY 2
Six semester hours (2 s/hrs lectures, 2 s/hrs tutorial 2 s/hrs practical).
Prerequisite: Biochemistry 1 (91313).

Principles of catalysis. Purification properties and nomenclature of enzymes. Vitamins and enzyme cofactors. Localisation of enzymes. Regulation of enzyme action at genetic and molecular levels. Cellular role of ATP. Oxidative phosphorylation and the mitochondrion. The electron transport chain. Glucose catabolism and anabolism. The glycolytic sequence. The pentose phosphate pathway. The citric acid cycle. Fatty acid synthesis. Oxidation of fatty acids. Membrane models. Breakdown of proteins and metabolism of amino acids. One carbon metabolism. Synthesis and degradation of nucleotides.

91321 BIOCHEMISTRY 3
Six semester hours (2 s/hrs lectures, 1 s/hr tutorial 3 s/hrs practical).
Prerequisite: Biochemistry 2 (91320).

Structure of biological membranes and implications for metabolite transport; the cell surface and recognition of extracellular modulators of cell function. Adaptive processes and enzyme regulation in metabolic control; biochemical devices for the amplification of metabolic response. Biosynthesis, secretion and action of hormones; detailed biochemistry of selected hormones.

Vitamins and trace metals in nutrition and their involvement in enzyme action as coenzymes, activators and regulators. Biochemistry of connective tissue and bone; calcium homeostasis. Specialized metabolism of nervous tissue; generation and transmission of the nerve impulse. Muscle proteins and the biochemistry of muscle contraction.

91322 BIOCHEMISTRY 4
Six semester hours (2 s/hrs lectures, 4 s/hrs practical).
Prerequisite: Biochemistry 3 (91321). Not required for Biotechnology major).

Biochemical pharmacology and toxicology: modes of action of widely used drugs including anti-depressants, addictive drugs, narcotics, analgesics, anaesthetics and anti-inflammatory drugs. The toxicity and metabolism of foreign compounds and their elimination from the body.
Biomedical Science: Biochemical aspects of disease states, cancer and carcinogenesis, rheumatoid arthritis and other inflammatory diseases, inherited metabolic diseases, mental disorders, alcoholism.

91326 ANALYTICAL BIOCHEMISTRY
Six semester hours (2 s/hrs lectures, 4 s/hrs practical).
Prerequisite: Biochemistry 1 (91313).

Modern analytical methods in Biochemistry with emphasis on instrumentation and underlying principles. Qualitative biochemical analysis. Spectroscopic methods (spectrophotometry, spectrofluorometry, flame emission and absorption photometry, magnetic resonance methods). Separation methods (chromatography, electrophoresis, centrifugation). Electro-chemical methods (potentiometry and ion electrodes, polarography). Introduction to radiochemistry. Errors in analysis. Implications of biochemical equilibria in analysis. Molecular biology techniques.

91330 MICROBIOLOGY 2
Six semester hours (2 s/hrs lecture, 4 s/hrs practical).
Prerequisite: Microbiology 1 (91314).

Microbial Physiology & Basic Applied Microbiology. Bacterial physiology-nutrition, energetics; biosynthesis and growth. Mechanisms and use of growth and physiological reactions in diagnostic and applied microbiology. Features of, and factors influencing, the microbial flora of habitats such as the higher animal body, soils, water supply and disposal systems and foods. The survival, growth and death of such flora; methods for identification and quantitation. Introduction to bacterial genetic systems and processes. Antimicrobial substances in the environmental, hospital and laboratory environments.

91331 MICROBIOLOGY 3
Six semester hours (2 s/hrs lectures, 4 s/hrs practical).
Prerequisite: Microbiology 2 (91330).

Public Health Microbiology. Basic epidemiological principles; mathematical formulation of epidemics;

sociological aspects and case studies in epidemiology. Microbiological safety; hygiene, health and safety in the work environment. The hospital and industrial environment; hygiene and sanitation control measures; sterilisation and disinfection. Microbiological aspects of the import and export of materials and products; quarantine. Food, water and airborne diseases; exotic and notifiable diseases; zoonoses. Vaccine production, vaccination procedures and programmes. Production of antisera.

91334 MOLECULAR BIOLOGY 1
Replacing 91334 - Introductory Molecular Biology from 1992.
Three semester hours
Prerequisites: Microbiology 1 (91314); Biochemistry 1 (91313)
Corequisites: Microbiology 2 (91330) and/or Biochemistry 2 (91320)

Introduction to the basis of present day molecular biology. Key concepts and procedures in bacterial and bacteriophage genetics, including mutation, recombination and mechanisms of genetic exchange, utilising plasmids, transposons and viruses. Introduction to the principles and procedures underlying DNA manipulation methods in the molecular biology laboratory, including the molecular cloning, selection and analysis of recombinant DNA.

91335 MOLECULAR BIOLOGY 2
Replacing 91335 - Advanced Molecular Biology from 1992.
Six semester hours
Preequisite: IMolecular Biology 1 (91334)

Techniques for the isolation, handling, characterisation, manipulation, sequencing, modification and synthesis of DNA elements into cells - microbial, animal and plant. Techniques for the isolation and characterisation of proteins and the use of computer generated models for the prediction and manipulation of their structure. The applications of animal and plant cell culture procedures to the production of specific products and improved strains of organism. The utilisation of genetically modified cells for the production of industrial, therapeutic and other products. Use of radionuclides in molecular biology. Safe practice, ethical and legal issues in the application of advanced biological technologies, and molecular biology laboratory management.

91337 CLINICAL MICROBIOLOGY
Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisite: Microbiology 2 (91330).

Tissue culture practices. Introductory virology; nature of viruses, viral multiplication; classification; identification. Diagnostic virology, involving isolation and serology of viruses of clinical and veterinary significance. Chemotherapy and interference principles. Epidemiological principles and advanced case studies, vaccine programs or control of viral and bacterial diseases. Diagnostic serology.

91341 BLOOD BANK
Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisites: Pathobiology 1 (91354), Pathobiology 2 (91355), Haematology (91358).

ABO serum and cell grouping. Rh typing. Albumin enzyme and Polybrene techniques. Direct and indirect Coombs' test. Pretransfusion compatibility tests. Antibody identification tests. Organisation of a blood bank. Investigation of transfusion reactions. Platelet serology.

91342 CLINICAL BIOCHEMISTRY 1
Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisite: Biochemistry 2 (91320).

Principles of Clinical Chemistry. Laboratory hazards and quality control including appropriate statistics as used in clinical biochemical laboratories. Introduction to calculations and analyses of clinically important substances. Pre-analytical procedures. Qualitative analysis as exemplified by urine analysis. Quantitative analysis as exemplified by inorganic phosphorus analysis. Spectroscopic identification of normal and abnormal haemoglobin pigments. Blood sugar estimations and basis of abnormalities of carbohydrate metabolism. Principles of clinical enzymology with particular reference to the methodology involved. Principle of automation involving discrete and continuous flow methods.

91343 CLINICAL BIOCHEMISTRY 2
Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisite: Clinical Biochemistry 1 (91342).

Measurements of Homeostasis and its Malfunction. Liver and kidney function and disorders. Regulation of electrolyte, water and acid-based balance. Serum protein patterns in health and disease. Abnormalities of lipid metabolism. Radio immunoassay, hormone evalu-

ation with special emphasis on thyroid function, isoenzymes, malabsorption syndromes, vitamin levels in clinical investigation.

91346 ENVIRONMENTAL MANAGEMENT PROCEDURES
Three semester hours
Prerequisite:

91347 TOXIC MATERIALS IN THE ENVIRONMENT
Three semester hours
Prerequisite:

91350 PRINCIPLES OF PHARMACOLOGY AND TOXICOLOGY
Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisites: Human Biology (91317), Biochemistry 1 (91313)

General principles governing drug action. Drug-receptor interactions. Dose-response measurements in pharmacology and toxicology. Effects of drugs and toxic substances on the cardiovascular system, the central nervous system, the respiratory system. Effects of drugs and toxic substances on metabolic and excretory function. Carcinogens and teratogens. Specific classes of toxic substances.

91351 IMMUNOLOGY 1
Part replacing 91355 - Pathology 2 (6 Hrs) and replacing 91351 - Introductory Immunology from 1992.

Three semester hours (1 s/hr lecture, 2 s/hr practical).
Pre-requisite: Microbiology 1 (91314), Biochemistry 1 (91313).

The immune system, including immunoglobulin and hypersensitivity, methods of detecting antibodies - agglutination, precipitation, indirect agglutination techniques, immunodiffusion, immune protection.

91354 ANATOMICAL PATHOLOGY
Replacing 91354 - Pathology 1 from 1992.
Six semester hours (2 s/hrs lectures, 4 s/hrs practical).
Prerequisites: Biology 2 (91312), Human Biology (91317), Chemistry 2 (62426).

This course provides a basic knowledge of disease processes, the body's responses to them (Pathology) and the preparation of body tissues for examination of structure (Histotechnology). The pathology strand of the subject includes the mechanisms of tissue injury and repair, the development of disease and the examination of the light microscopic appearance of these mechanisms. The histotechnology strand incorporates the chemistry of biological dyes, their uses in the laboratory to highlight normal tissue structures and demonstrate pathological tissue changes. These two disciplines are integrated to present an understanding of disease, its morphological appearance and the laboratory techniques used to interpret these changes.

91355 HAEMATOLOGY 1
Part replacing 91355 - Pathology 2 (6 Hrs) from 1992.
Three semester hours (1 s/hrs lectures, 2 s/hrs practical).
Prerequisites: Pathobiology 1 (91354), Microbiology 1 (91314), Biochemistry 1 (91313).

Introduction to structure and function of blood as a tissue, proteins in blood and other tissues. Structure and function of the various types of blood cells and platelets; homeostasis and disorders of the blood; congenital and acquired haemolytic states; blood collection and quality control.

91356 DIAGNOSTIC CYTOLOGY 1
Six semester hours (2 s/hrs lectures, 4 s/hrs practical).
Prerequisites: Pathobiology 1 (91354), Pathobiology 2 (91355).

The course provides instruction and practical application in the interpretation and diagnosis, at the light microscope level, of cell samples from all surfaces of the female genital tract. The morphologic features of normal states, inflammatory effects, physiologic patterns, hormonal effects, changes due to specific organisms and viruses, premalignant and malignant conditions and effects of treatment on cell morphology are covered. Principles and procedures of specimen collection, preparation and staining procedures, reporting methods and laboratory systems and procedures are included. At the end of the course the student should be able to diagnose a wide range of physiologic states as well as benign, premalignant and malignant conditions of epithelia of the female genital tract.

91357 DIAGNOSTIC CYTOLOGY 2
Six semester hours (2 s/hrs lectures, 4 s/hrs practical).
Prerequisite: Diagnostic Cytology 1 (91356).

Instruction and practical application in the interpretation of benign and malignant states from cell samples of anatomical sites other than the female genital tract. These include the respiratory tract, alimentary tract, urinary tract, serous cavities, central nervous system, breast and thryoid. Specimen collection procedures

relevant to specific body sites are covered and there is emphasis on the collection and interpretation of fine needle aspiration samples. Epidemiology and aetiologic factors in malignant diseases and special procedures which complement cytologic diagnoses are included.

91358 HAEMATOLOGY 2
Replacing 91358 - Haematology from 1992.
Six semester hours (2 s/hr lecture, 4 s/hrs practical).
Prerequisite: Pathobiology 2 (91355).

Correlation of physiological processes, pathological state and diagnostic tools in haematology; quality control and automation; cytogenetics; morphology of peripheral blood films and bone marrows.

91359 IMMUNOLOGY 2
Replacing 91359 - Advanced Immunology from 1992.
Six semester hours (1 s/hr lecture, 1 s/hr tutorial, 4 s/hrs practical).
Prerequisite: Pathobiology 2 (91355) or Introductory Immunology (91351)

This course provides current concepts of modern immunology to students who have some basic understanding of the subject, and an appreciation of the wide spectrum of applied immunology in medicine, research and industry. Specialised areas of immunology covered include: macrophages and tumour immunology, natural killer cell activity in immunosurveillance, lymphokines and monoclonal antibodies. In addition, techniques applicable both in laboratory and industrial research including enzyme-linked immunoabsorbent assay (EIA); cell separation techniques and monoclonal antibodies will also be examined.

91360 QUANTITATIVE ECOLOGY
Six semester hours (2 s/hr lecture, 4 s/hr practical/ tutorial).
Prerequisites: Biology 2 (91312), Biocomputing (91395), Introductory Biometrics (33105) or Horticultural Experimentation (91201).

Measurement and analysis as part of the resource management process. Techniques of estimating population size and density of sedentary organisms; sampling methods, assessment and data analysis in aquatic and terrestrial systems. Techniques for sampling multispecies communities and mobile organisms. Estimations of biomass and productivity. Principles of identification and categorisation of key groups of indicator organisms in aquatic and terrestrial systems, including major groups of plants, invertebrates and microbial groups. The design and use of keys. Collection, preservation and identification of specimens from the field. This subject will include compulsory field excursions to develop skills of field identification of organisms and measurement techniques, both aquatic and terrestrial.

91362 PLANT ECOPHYSIOLOGY
Six semester hours (2 s/hrs lectures, 4 s/hr tutorial, practical).
Prerequisite: Quantitative Ecology (91360).

Principles of plant classification with reference to Australian groups. Introductory geology, soil formation, soil structure, classification and analysis. Anatomical and other responses of plants to environmental stress. Carbon metabolism and factors affecting growth and development. Nitrogen fixation and nutrient cycling. The role of plants in the biosphere. This subject will include compulsory field excursions.

91363 ANIMAL ECOPHYSIOLOGY
Six semester hours (2 s/hrs lectures, 1 s/hr tutorial, 3 s/ hrs practical).
Prerequisites: Human Biology (91317), Quantitative Ecology (91360).

Basic concepts in ecophysiology; limiting factors, lethal limits, acclimation. Patterns of physiological responses to natural and selected man-made stressors. Co-ordination of physiological processes with environmental factors; neuro-endocrine control of life cycles and physiological responses, stress syndrome. Population changes; basic animal population dynamics, structure, growth and regulation of populations. This subject includes a compulsory field excursion.

91364 AQUATIC ECOLOGY
Six semester hours (2 s/hrs lectures, 4 s/hrs practical).
Prerequisites: Plant Ecophysiology (91362), Animal Ecophysiology (91363).

Australian water resources and the hydrological cycle. Structural components and functional processes of aquatic ecosystems; physical, chemical and biological features; energy flows and nutrient cycles. Distinctive features of lakes, rivers and streams, estuaries, coastal lagoons and the sea. Assessment and monitoring of water pollution problems; water quality and biological surveillance. Management of polluted and disturbed aquatic habitats. Management of water supply reservoirs. This subject will involve a number of compulsory field excursions.

91365 TERRESTRIAL ECOLOGY
Six semester hours (2 s/hrs lectures, 4 s/hrs practical).
Preequisites: Plant Ecophysiology (91362), Animal Ecophysiology (91363).

Ecosystem concepts and their application to ecological management. Ecosystem dynamics. Major world ecosystems and associated non-biotic mechanisms. Major Australian terrestrial ecosystems and their management. Fire; its ecological impacts and management. Case studies in applied ecology. This subject will include compulsory field excursions. Use will also be made of reports of statutory authorities, management plans and environmental impact assessments.

91366 PEST CONTROL AND TOXICOLOGY
Six semester hours (2 s/hrs lectures, 4 s/hrs practical/ tutorial).
Prerequisite: Human Biology (91317), Quantitative Ecology (91360)

Biological and chemical principles of pest control; the safe use of pesticides. Methods of toxicological testing for pesticides, heavy metals and other hazardous chemicals, in air, soil and water, using biological assays of animals and plants.

91367 APPLIED ECOLOGY
Six semester hours (2 s/hrs lectures/seminars, 4 s/hrs project).
Prerequisites: Aquatic Ecology (91364), Terrestrial Ecology (91365).

The lecture/seminar component of this subject will deal with the following:-
Environmental legislation; the NSW Environmental Acts and their associated regulations; Comparison of the Federal Acts with those from other States; Significance of socio-economic factors on decision making in environmental matters; Cost benefit analysis and prediction of social impact; Environmental impact assessment; Objectives, contents and procedures for the preparation of environmental impact statements.

Project:-
A major part of this subject will be devoted to a research project which will normally be carried out in small groups. An individual detailed report on the project will be submitted by each student. This subject is normally to be taken in the last semester of the undergraduate work, since it draws on the expertise derived from all other subjects in the course. This subject will involve a compulsory field excursion.

91368 MICROBIAL TECHNOLOGY 1
Six semester hours (2 s/hrs lectures, 4 s/hrs practical/ tutorial).
Prerequisite: Microbiology 2 (91330).

Fermentation Technology. Processes of formation and extraction of useful products of microbial, animal and plant cells The microbiological, physiological and biochemical bases of industrially useful fermentations, in the food beverage and pharmaceutical and other relevant industries. Unit operations and processing procedures in industrial fermentations. Computer interfacing and control procedures for fermentation systems. Economic and other factors impinging on the operation of fermentation industries. Industrial visits and a literature project are compulsory parts of the subject.

91369 MICROBIAL TECHNOLOGY 2
Six semester hours (2 s/hr lectures, 4 s/hr practical).
Prerequisite: Microbial Technology 1 (91368) or Microbiology 3 (91331).

Industrial Microbiology in Practice. Microbiological quality control in the food, beverage, pharmaceutical, cosmetic and related industries - raw material to finished product. Hygiene practices as related to quality control and safety. Modern developments in microbial detection and quantitation; metabolite assays.

91372 CLINICAL BACTERIOLOGY AND PARASITOLOGY
Nine semester hours (3 s/hr lectures, 6 s/hr laboratory).
Prerequisite: Microbiology 3 (91331).

Quantitative methods, reliability studies, automation, data processing and numerical analysis in clinical microbiology. Pathogenic microorganisms: their handling (including safety requirements), cultivation, isolation and relationship to the indigenous flora of man and animals. A detailed study of staphylococci, streptococci, corynebacteria, mycobacteria, neisseria, enteric bacteria, pasteurellae, pseudomonads and spirochaetas. Antibiotics and antibiotic sensitivity testing. Pathogens of veterinary significance. Parasites (protozoa and helminths) of medical and veterinary importance; methods for handling specimens and laboratory diagnosis.

91373 CLINICAL AND APPLIED MYCOLOGY
Three semester hours (1 s/hr lectures, 2 s/hr laboratory).
Prerequisite: Microbiology 2 (91330).

The structure, function and classification of fungi, with particular reference to those of clinical, industrial, veterinary and agronomic significance. The growth processes and identification of fungi, as causative agents of

human and animal disease; and as agents of biological breakdown and deterioration. Control procedures for fungi. Each student will undertake a literature and/or laboratory project related to his/her major study area.

91374 TISSUE CULTURE
Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisites: Pathobiology 2 (91355) or Introductory Immunology (91351).

Theoretical and practical aspects of the cultivation of animal cells and tissues *in vitro*. Basic principles of culture; establishment of cell lines; adherent and suspension cultures; harvesting and propagation; organ cultures; storage of cultures; cell fusion; use of cultures to produce and test for specific products; culture dynamics; flow cytometry; mutation and trans-formation *in vitro*.

91376 ENVIRONMENTAL MEASUREMENT
Three semester hours
Prerequisites: Biology 2 (91312) ; Introductory Biometrics (33105); Biocomputing (91395)

Measurement and analysis as part of the resource management process. Techniques of estimating population size and density of sedentary organisms; sampling methods, assessments and data analysis in aquatic and terrestrial systems. Techniques for sampling multi-species communities and mobile organisms. Estimations of biomass and productivity. This subject involves a compulsory excursion to develop skills of field identification of organisms and measurement techniques, aquatic and terrestrial.

91378 CONCEPTS IN BIOLOGY (P/T) (2 Sem)
Three semester hours for two semesters (1 s/hr lecture, 2 s/hrs practical).
Equivalent to 91388 below.

91379 ENVIRONMENTAL SCIENCE FOR ENGINEERS
Three semester hours.
Elective subject available to Engineering students.

91384 PROJECT (HONOURS - BIOLOGICAL & BIOMEDICAL) P/T (3 Sem)
Twenty seven semester hours.

For part-time students enrolled in Honours degree over a two year period. See 91394 for description.

91388 CONCEPTS IN BIOLOGY (F/T) (1 Sem)
Six semester hours (2 s/hrs lectures, 1 s/hr tutorial, 3 s/hrs practical).
Elective available to students from Physical Sciences and other Faculties.

NOTE: For the degree in Urban Horticulture this subject is to be taken only by entrants with an Associate Diploma in Horticulture or equivalent qualifications.

This subject is designed as a one-semester introductory course in biology, suitable as an elective subject for students in Physical Sciences, providing an introduction to the major principles of biological science, and the importance of this branch of science in a world of advanced technology. Life exists in general on three planes of organisation: cell, organism and population. Life is self-perpetuating, diverse and evolving. The biosphere represents a complexly balanced system involving a cycling of materials and a continuous flow of energy. Science, technology, industrialisation and population pressures are all having increasing impacts on the biosphere.

91392 RESEARCH METHODOLOGY (HONOURS - BIOLOGICAL & BIOMEDICAL)
Three semester hours.

Approaches to research; defining the problem; planning the experimental work; interpretation of laboratory data; application of relevant statistical methods; critical analysis.

91393 READING ASSIGNMENT (HONOURS - BIOLOGICAL & BIOMEDICAL)
Six semester hours.

Each student is required to complete either:
(a) an extensive reading assignment and a 4,000 word written critical analysis on a topic different from his/her research project work
OR
(b) senior undergraduate and/or postgraduate subjects amounting to 6 semesters hours of study.

91394 PROJECT (HONOURS - BIOLOGICAL & BIOMEDICAL) F/T (2 Sem)
Twenty seven semester hours.

The project will take the form of an in-depth experimental or theoretical investigation into a problem of social or industrial relevance. The results of the investigation, together with a critical literature review, will form the

basis of a thesis to be submitted by the last week of the Spring Semester. Each student will be required to present a seminar on his or her work at the end of the year. Each student will be individually supervised by a full-time member of the academic staff of the School throughout the course of the project.

91395 BIOCOMPUTING
Three semester hours (1 s/hr lecture, 2 s/hrs tutorial).
Prerequisites: Statistics (L/S) (33103).

Introduction to computers and programmes in the biological sciences. Analysis of the operation of computer systems with emphasis on principles of hardware architecture, operating systems, editors and file management. Comparison of various types of computers, IBM PC, Macintosh, Amdahl mainframe, and various software packages available to the biological and biomedical sciences.

91396 ADVANCED BIOCOMPUTING
Three semester hours (1 s/hr lecture, 2 s/hrs practical/tutorial).
Prerequisite: Biocomputing - (91395).

Computer programming techniques with emphasis on structured programming using PASCAL. Problem analysis and development of solution structures. Writing and verifying programmes.

91398 SPECIAL READING ASIGNMENT - LIFE SCIENCES
Three semester hours.

91399 INDIVIDUAL PROJECT - LIFE SCIENCES
Six semester hours.

91403 PHYSICS IN MEDICINE 1
Three semester hours.

Nuclear medicine - Radioisotopes, physics, use, - instrumentation - gamma camera, rectilinear scanner, PET, SPECT, - image quality and artifact. Radiology - generation, detection and properties of X-rays, - DSA, CT. Magnetic Resonance Imaging.

91404 PHYSICS IN MEDICINE 2
Three semester hours.

Radiotherapy sources of Radiation. Radiation beam parameter. Measurement of therapy level radiation. Simulators. Dose distribution, Brachytherapy. Quality Assurance. Safety. Non-ionizing Radiation - Lasers, UV. Ultrasound - generation, detection and properties of Ultrasound, - B and M mode scanning, Electronic Array Scanning.

91405 BIOELECTRONICS
Three semester hours.
Corequisite: Advanced Mathematics in the Life Sciences.

Basic concepts of electronic measurement techniques, signals, transducers, electronic processing, display: Basic electrical concepts and measurements: charge, current voltage and resistance in simple circuits, thevenin equivalence. Frequency dependent circuits: inductors, capacitors, impedance and reactance, RC, RL and RLC circuits, simple filters. Semi-conductors, diodes, FET and junction transistors. Amplifiers: operational. Digital Logic: simple gates and truth tables, flip-flops, counters, registers, monostables, analogue to digital conversion. Data displays and recorders: principles of recorders and oscilloscopes. Power distribution and electrical safety.

91406 PROJECT (Clinical Measurement) F/T (4.5 Hrs) (4 Sem)
Four and a half semester hours for four semesters.
Prerequisite: All foundation subjects.

Candidates are required to undertake a project and prepare a report. The project is designed to introduce them to problem solving situations in applied fields relevant to their interests and/or professional experience. Projects may take the form of experimental investigations, design studies, extensive critical reviews or other suitable activities. If possible, projects will be chosen in co-operation with hospital and medical institutions so that candidates have some introduction to professional practice. The project will be completed in accordance with the Rules for Masters Degree by Coursework.

91407 PROJECT (Clinical Measurement) P/T (9 Hrs) (2 Sem)
Nine semester hours for two semesters.
Prerequisite: All foundation subjects.
See 91406 for description.

91408 PRINCIPLES OF BIOCOMPUTING
Three semester hours (1 s/hr lecture, 2 s/hrs tutorial).
Prerequisites: Some knowledge of basic maths and statistics is assumed.

Overview of computer systems and applications: principles of computer hardware, IBM PC series. Principles of operating systems: MS-DOS, UNIX. Introduction to software packages: wordprocessing and editors,

statistical, spreadsheets, databases, data acquisition and modelling. Principles of 3rd generation languages and structured programming. The Pascal language: commands, input/output, control statements, data types, arrays, data files.

91412 BIOMEDICAL SCIENCES 1
Six semester hours.

91413 BIOMEDICAL SCIENCES 2
Six semester hours.

91414 ANALYTICAL BIOCHEMISTRY PROJECT 1
Three semester hours.

91415 ANALYTICAL BIOCHEMISTRY PROJECT 2
Three semester hours.

91417 CLINICAL LABORATORY MANAGEMENT
Three semester hours (2 s/hrs lectures, 1 s/hr tutorial).

Theoretical considerations of planning, staffing, organising and controlling. Problem identification in laboratories. Aspects of accounting and finance. Use of multiphasic health screening. Labour relations. Methods evaluation. Ethical and legal considerations affecting laboratory personnel.

91419 CASE STUDIES IN CLINICAL BIOCHEMISTRY
Three semester hours (lecture/tutorial).
Prerequisite: Clinical Biochemistry 2 (91343).

A variety of case studies, each illustrative of a different kind of problem, will be introduced. Real and simulated cases which involve conceptual and practical problems stemming from uncertain or ambivalent analytical procedures, faulty instrument calibration, poor quality control, inappropriate data handling, and unexpected or apparently inexplicable relationships between sets of biochemical data are used. Students work individually or in groups, studying particular cases, leading class discussions, and suggesting alternative technical or management procedures as well as new technological innovations that might be usefully employed in each case.

91420 PRINCIPLES OF BIOSCIENCE
Three semester hours (1 s/hr lecture, 2 s/hrs practical/tutorial).
Prerequisites: Some knowledge of physics, chemistry and mathematics is assumed.

A course for graduates with little previous experience in biology structure and function of cells and organs. Diffusion and transport. Bioenergetics. Cell reproduction and genetics.

91421 PRINCIPLES OF HUMAN BIOLOGY
Six semester hours (2 s/hrs lectures, 4 s/hrs practical/tutorial).
Prerequisites: Knowledge of basic biological concepts is assumed.

Basic human organisation - tissues, fluids, skeletal and muscular systems. Biological control systems - essentials of control systems, the nervous and hormonal systems. Integrated structure and function of cardiovascular, lymphatic, respiratory, gastrointestinal, renal and reproductive systems, Introductory human genetics - human variability, basic population genetics, mutations, problems of counselling.

91422 PRINCIPLES OF BIOINSTRUMENTATION
Six semester hours.

91423 CLINICAL BIOCHEMISTRY - ADVANCED ASPECTS A
Six semester hours (2 s/hrs lectures, 4 s/hrs practical/tutorials).
Prerequisite: Clinical Biochemistry 1 (91342).

Toxicology and drug metabolism; modern methods for the screening, identification and quantitation of drugs of abuse. Clinical biochemistry of foeto-placental function, gastrointestinal function, the porphyrias and the catecholamines. Principles and practice of instrument evaluation. Advanced techniques in clinical biochemistry; IR Spectroscopy, GLC, GC/Mass spectrometry, HPLC, ion-selective electrodes.

91424 CLINICAL BIOCHEMISTRY - ADVANCED ASPECTS B
Six semester hours (2 s/hrs lectures, 4 s/hrs practical/tutorials).
Prerequisite: Clinical Biochemistry 1 (91342).

Chemical pathology of liver and kidney function; pathophysiological effects of alcohol abuse, viral infection and choleostasis. The endocrine tissues; thyroid, adrenal and gonadal function. Theoretical and practical

aspects of immunoassay. Inborn errors of metabolism; screening methods and investigation of the genome. Chemical diagnosis of diabetic states, hypertension and myocardial infarction. Immunological disorders; detection and diagnosis.

91432 LABORATORY BIOCOMPUTING
Six semester hours.

91433 BIOSTATISTICS
Three semester hours (1 s/hr lecture, 2 s/hrs tutorial).
Corequisite: Principles of Biocomputing (91408) or equivalent.

Review of parametric and non-parametric statistics applied to the clinical field; population distributions, tests of significance, selection of suitable statistical tests, analysis of variance, correlation and regression analysis, experimental design. Use of major computer packages (SPSS, minitab) for statistics.

91434 RADIATION PROTECTION
Three semester hours (1 s/hr lecture, 2 s/hrs tutorial/ practical).

Principles and techniques of radiological protection including: Basic physics; radiation, its sources and properties; radiation units; detection and measurement principles; health physics instruments; radiation dosimetry (ionising and non-ionising); principles of radiation control; radiation protection standards; shielding fundamentals; principles of radioactive waste disposal; safety design of nuclear laboratories; administrative aspects of radiological protection; legal aspects; accelerators and cyclotrons; transport of radioactive materials.

NOTE: Students will be required to attend at least 2 days for excursion at the Australian School of Nuclear Technology, Lucas Heights, during one of the tutorial weeks for practical work on the safe handling of radioactive materials.

91436 ADVANCED MATHEMATICS IN LIFE SCIENCES
Three semester hours.
Prerequisite: Some knowledge of basic mathematics is assumed.

Calculus: differentiation, integration, numerical methods of integration. Complex Numbers: j operator, summation, multiplication. Linear and Vector Algebra: Matrix operations, inversions, determinants. Differential Equations: ordinary and partial, solutions. Transformations: Fourier, Laplace, inverse transformations, DFT, FFT, correlations. Number Theory: Binary, Octal, Decimal, Hexadecimal. Boolean Algebra.

91437 ADVANCED BIOINSTRUMENTATION
Three semester hours
Prerequisite: Equivalent to Certificate in Electronics and Computing in Life Sciences and Certificate in Human Biology.

Review of impedance concepts, complex number and vector techniques, application to RLC circuits. Analogue filters; steady state and transient response, anti-aliasing. Operational, instrumentation and biomedical amplifiers, high impedance techniques. Analogue building blocks, active filters, frequency to voltage converters. Review of digital logic concepts and functions: flip-flops, monostables, counters, counting systems, displays. Analogue/digital interconversions, comparison of methods. Electronic noise: sources, avoidance, reduction methods. Electronic construction techniques.

91438 BIOSENSORS AND TRANSDUCERS
Three semester hours

Biocompatibility. Electrodes - ECG, EEG, neurophysiology, pacemakers etc. Pressure - invasive, non-invasive. Light - oxygen monitoring in Hb, CCD's. Displacement, strain, angular measurement. Temperature. Electrochemical electrodes - pH, ion selective. Biosensors. Doppler Ultrasound. Hardware and manufacturing.

91439 PHYSIOLOGICAL MEASUREMENT
Three semester hours

Blood flow - Ultrasound, radioisotope techniques, electromagnetic effects. Cardiac Output - Fick technique, radioisotopes. Neurological and Electrophysiological Studies - EEG, ECG, Heart, Nerve and Brain Stem, Evoked Potential Membrane physiology, electrical propagation. Respiratory Measurements / Spirometry. Implantable Devices - Telemetry of information. Audiometry. Biomagnetic and Impedance Imaging.

91442 TOXICOLOGICAL TESTING - BIOASSAY
Six semester hours 2 s/hr lecture, 4 s/hrs practical).
Prerequisites: Introduction to Toxicology (91448) and Experimental Design (91449)

Toxicity tests to determine acute and chronic effects of toxic substances on a wide range of organisms e.g. fish, invertebrates, plants. Analysis and interpretation of results.

91443 ENVIRONMENTAL MANAGEMENT
Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisites: Introduction to Toxicology (91448) and Experimental Design (91449)

Environmental legislation; the NSW Environmental Acts and their associated regulations; comparison of the Federal Acts with those from other States; Significance of socio-economic factors on decision making in environmental matters; Cost benefit analysis and prediction of social impact; Environmental impact assessment; Objectives, contents and procedures for the preparation of environmental impact statements.

National and international environmental legislation. Risk analysis and management strategies to reduce risk from environmental pollution. Use of toxicological data in Environmental Impact Statements.

91444 ANALYTICAL TECHNIQUES IN TOXICOLOGY
Six semester hours (2 s/hrs lecture, 4 s/hrs practical/ tutorial).
Prerequisites: Introduction to Toxicology (91448), Experimental Design (91449).
Corequisites: Biochemical Toxicology (91445).

Techniques and instrumentation used for toxicological testing of environmental and biological samples.

91445 BIOCHEMICAL TOXICOLOGY
Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisites: Introduction to Toxicology (91448).
Corequisites: Analytical Techniques in Toxicology (91444).

Biochemical mechanisms involved in entry, transformation and removal of toxic substances in plants, animals and selected micro-organisms.

91446 FIELD SURVEILLANCE AND MANAGEMENT OF TOXIC SUBSTANCES
Six semester hours (2 s/hrs lecture, 4 s/hrs practical/ tutorial).
Prerequisites: Introduction to Toxicology (91448), Experimental Design (91449).
Corequisites: Environmental Accumulation and Transformation of Toxic Substances (91447).

Field monitoring for the effects of toxic substances. Use of biological indices to assess impact of toxic substances. Application of bioassay data to natural ecosystems.

91447 ENVIRONMENTAL ACCUMULATION & TRANSFORMATION OF TOXIC SUBSTANCES
Three semester hours (1 s/hr lecture, 2 s/hr practical).
Prerequisites: Introduction to Toxicology (91448).
Corequisites: Field Surveillance and Management of Toxic Substances (91446).

Pathways of toxic substances in the environment. Transfer mechanisms between different environment compartment. Bioaccumulation and biotransformation.

91448 INTRODUCTION TO TOXICOLOGY
Three semester hours (1 s/hr lecture, 2 s/hrs practical).
Prerequisites: Nil.

Strand A
Historical development of toxicology and environmental toxicology. The sources and behaviour of the main classes of toxic substances in the environment, their effects on tissues, organs, organisms and ecosystems. Introduction to community ecology and ecological processes. Environmental toxicology and human and occupational health. National and international standards for toxicological testing.

Strand B
The use of mammalian species in toxicity testing. Examination of the effects of the main classes of natural and artificial poisons on specific organ systems of mammals. Care and maintenance of laboratory animals and special problems associated with their use in toxicity testing. Mutagenesis, carcinogenesis and teratogenesis.

91449 EXPERIMENTAL DESIGN
NB: Replaced in 1992 by 91433 Biostatistics.
Three semester hours (1 s/hr lecture, 2 s/hrs practical/ tutorial).
Prerequisites: Assumed knowledge of Biostatistics or equivalent.
Corequisites: Introduction to Toxicology (91448).

Design and analysis of biological experiments. Basic parametric statistical methods and their applications in toxicology: analysis of variance, the factorial experiment, an experiment with two factors, control of error, compounding. Interrelations of two or more variables: regression, multiple regression, correlation. Non-parametric statistical tests. Data transformations; probit analysis. The use of computers and statistical packages in the analysis of toxicological data.

91450 PROJECT (Environmental Toxicology) P/T (9 Hrs) (2 Sem)
Nine hours per week for two semesters.

All Masters candidates must undertake a project and prepare a report. The project is designed to introduce them to problem solving situations in applied fields relevant to their interests. Projects may take the form of experimental investigations, design studies, extensive critical reviews or other suitable activities. If possible, projects will be chosen in co-operation with employers so that candidates have some introduction to professional practice. The project will be completed in accordance with the Rules for Masters Degree by Coursework.

91453 PROJECT (Clinical Biochemistry) - 3 Hrs
Three hours per week for one semester.

Students are required to complete a total eighteen semester hours (extending over three semesters) from the three Project subject options - 91453 - 3 Hrs., 91456 - 6 Hrs., 91459 - 9 Hrs. Students undertake investigatory and developmental work in an area of clinical biochemistry. Projects are carried out at the students' places of employment and are generally related to current problems or new developments in those laboratories. Students are expected to develop skills in research design and methodology, and also in the collection, critical evaluation and presentation of scientific data. The project will be completed in accordance with the Rules for Masters Degree by Coursework.

91456 PROJECT (Clinical Biochemistry) - 6 Hrs
Six hours per week for one semester.
See subject description for 91453.

91459 PROJECT (Clinical Biochemistry) - 9 Hrs
Nine hours per week for one semester.
See subject description for 91453.

91460 PROJECT (Environmental Toxicology) F/T (4.5 Hrs) (4 Sem)
Four and a half hours per week for four semesters.
See subject description for 91450

91461 PHYSIOLOGICAL MODELLING
Three semester hours (1.5 s/hr lecture, 1.5 s/hr tutorial).
Prerequisite: Principles of Biocomputing (91408).

An introduction to the analysis of dynamic behaviour in biological and physical systems, with emphasis on the development of suitable mathematical models. General development of models; philosophy, variables, states, signal flows and parameters. Computational block models; simulations using THTSIM. Expression-based modelling languages. Example biological models; compartment models, driven models, non-linear models. Integration errors. Validation of dynamic models against data.

91462 MEDICAL IMAGING & SIGNAL PROCESSING
Three semester hours

Analogue and Digital Techniques; demeaning. Auto-Correlation and Cross-Correlation, Linear Predictive Coding, Digital Filter. Signal Averaging Techniques; jitter, noise reduction. Transformations - 1 and 2D Fourier, Z, Laplace etc. Edge Detection. Tomography. Real time processing. Image and array processing hardware. Image and signal compression techniques.

91463 HARDWARE FOR CLINICAL DATA ACQUISITION AND CONTROL
Three semester hours

Typical hardware systems in the Life Sciences. CPU operation - microprocessor operations, memory, I/O interfacing, DMA. Turbo Debugger Environment. Display Hardware - text mode, memory mapping, monochrome, CGA, EGA, VGA. Keyboard Operation. Bus Architecture. Communications Hardware. Peripheral Systems - (Real World Interfacing) Data Acquisition and Control Boards, Frame Grabbers, CCD/Video, Controllers, IEEE 488 interface bus, RS232C and centronics connections.

91464 LABORATORY BIOCOMPUTING
Three semester hours

Intel assembler language. Use of Turbo Assembler debugger. Accessing systems hardware, data acquisition and control cards and interface cards. Interfacing to other languages (eg. Turbo Pascal). Use of Interrupts (DOS, BIOS, Hardware and interrupt handlers). When and Why to use Assembler code. Practical applications in medicine and biology.

91465 ADVANCED PROGRAMMING - LIFE SCIENCES
Three semester hours.
Prerequisites: Principles of Biocomputing (91408) and Advanced Mathematics in the Life Sciences (91436) or equivalent.

Interfacing programmes with medical and biological applications. Advanced Pascal Features, Records and Sets, Dynamic Structures, Pointers, Data Base Structures, Interrupt Handlers, Graphics, Port Instructions.

Clinical interface programming using data acquisition and control boards. Data Acquisition Programming Languages - Interface Drivers.

91484 PROJECT (Medical Physics) F/T (4.5 Hrs) (4 Sem)
Four and a half semester hours for four semesters.
Prerequisite: All foundation subjects.

Candidates are required to undertake a project and prepare a report. The project is designed to introduce them to problem solving situations in applied fields relevant to their interests and/or professional experience. Projects may take the form of experimental investigations, design studies, extensive critical reviews or other suitable activities. If possible, projects will be chosen in co-operation with hospital and medical institutions so that candidates have some introduction to professional practice. The project will be completed in accordance with the Rules for Masters Degree by Coursework.

91489 PROJECT (Medical Physics) P/T (9 Hrs) (2 Sem)
Nine semester hours for two semesters.
See 91484 for subject description.

91498 SPECIAL READING ASIGNMENT P/G - LIFE SCIENCES
Three semester hours.

91499 INDIVIDUAL PROJECT P/G - LIFE SCIENCES
Six semester hours.

91777 MASTERS THESIS (Biol. & Biomed) (F/T)

91778 MASTERS THESIS (Biol. & Biomed) (P/T)

91987 DOCTORAL THESIS (Biol. & Biomed) (P/T)

91988 DOCTORAL THESIS (Biol. & Biomed) (F/T)

91997 PROFESSIONAL EXPERIENCE (Biol/Biom) (F/T)

Full-time students employed in an area relevant to their course in place of their studies should enrol in this subject in every semester for which they are employed.
Note: Professional Experience subjects do not incur a HECS liability

91999 PROFESSIONAL EXPERIENCE (Biol/Biom) (P/T)

All part-time students employed full-time in an area relevant to their course should enrol in this subject in every semester for which they are employed. This will be shown on your academic record to indicate your employment while studying.
Note: Professional Experience subjects do not incur a HECS liability

SUBJECTS OFFERED IN COASTAL RESOURCES MANAGEMENT COURSES

98201 ENVIRONMENTAL ECONOMICS AND ECOLOGICALLY SUSTAINABLE DEVELOPMENT
Three semester hours

This module concentrates on the fundamental economic principles that underlie the allocation of coastal resources. The concept of ecologically sustainable development will be considered within an economic framework, and its significance to coastal resources will be assessed. Case studies and applications of environmental economic techniques to coastal resource management problems will be investigated.

98202 COASTAL PLANNING AND DEVELOPMENT
Three semester hours
Prerequisite: Law and Coastal Resources.

The aims of planning will be analysed: functional, economic, social, environmental, and aesthetic. The planning process in theory will be explored, and the reality of planning processes will be compared and contrasted with the theoretical models. Case studies from Australian coastal areas, and overseas examples, will be used.

98203 COASTAL MANAGEMENT AND ADMINISTRATION
Three semester hours
Prerequisite: Coastal Resource Management 2.

This subject deals with the human aspects of management for organisations that have some responsibility over coastal resources. It examines both internal matters, such as organisational structure and function, as well as external issues, such as conflict resolution and negotiation with other groups in the community. It recognises that coastal resource management goals can be achieved only by organisations which are themselves

effectively managed, and deal appropriately with external groups which impact on the achievement of these goals.

98204 COASTAL TOURISM, RECREATION AND NATURAL SYSTEMS MANAGEMENT
Three semester hours
Prerequisites: Coastal Resource Management 2.

This subject examines the management issues that arise from the use of coastal areas for leisure. The Australian coast is a significant site for recreation and tourist activities, particularly its natural areas. To ensure that these areas are managed sustainably it is essential to consider the impacts and implications of this use for the natural coastal systems and develop techniques that will allow this use to continue.

98401 ESTURINE AND COASTAL HYDRAULICS
Three semester hours

This subject provides an introduction to physical processes in rivers, estuaries and marine waters. Stream flows, mixing patterns, generation processes of water waves and tides, and sediment transport processes will be dealt with. The interactions of these processes with coastal engineering activities will be emphasised.

98601 COASTAL GEOLOGY
Three semester hours

The subject deals with geological materials, processes and depositional environments within the coastal zone. Implications of these resources for environmental and management strategy formulation will be explored.

98602 COASTAL ENVIRONMENTAL CHEMISTRY
Three semester hours

This subject focuses on basic environmental chemistry of estuarine and ocean waters, and freshwater inputs from river systems. The significance of levels and changes in such parameters as pH, salinity, temperature, dissolved oxygen, stratification, turbidity, and the presence of pollutants, will be examined.

98603 GEOLOGICAL RESOURCES AND DEVELOPMENT IN COASTAL REGIONS
Three semester hours
Prerequisites: Coastal Geology Estuarine and Coastal Hydraulics
Corequisite: Resource Measurement & Assessment.

The development of coastal systems through time will be considered. Topographic and bathymetric maps and their interpretation will be introduced. The nature and dynamics of sandy barrier coasts, coral reefs, cliff-dominated erosive coasts, and aggregates of mineral resources and their exploitation will be examined. Geological implications in coastal zone management and planning will be considered.

98701 LAW AND COASTAL RESOURCES
Three semester hours
Prerequisites: Completion of first year of studies.

A survey will be made of those areas of law that are designed to control or regulate environmental quality of coastal resources. The subject covers the common law heritage and the major statutory and common law controls over pollution, use of land, terrestrial, aquatic, and heritage resources. The emphasis will be on Australian legislation in comparison with other countries.

98901 COASTAL RESOURCE MANAGEMENT 1
Three semester hours

This introductory unit provides pointers to most aspects
of the course, starting with a consideration of the definition of the coastal zone, and coastal resources. Regulatory frameworks, in Australia and overseas, and the roles of organisations involved in coastal resource management will be discussed. The interdisciplinary nature of coastal resources problems, conflicts, and issues, will also be considered.

98902 BIOLOGICAL SYSTEMS
Three semester hours

The interactions of various levels of organisation in living systems will be introduced and explored.- from molecules and cells to organs, organisms, populations, and total communities of many species. Animal and plant responses to natural and human-induced stresses, in aquatic and related terrestrial environments, will be considered, and approaches to field monitoring and measurement of changes will be introduced. The notion of ecologically sustainable development will be examined.

98903 EXPERIMENTAL DESIGN AND RESOURCES MANAGEMENT
Three semester hours
Prerequisites: Completion of first semester requirements.

The focus of this subject is the role and significance of experimental design and analysis in natural coastal systems. The emphasis will be on experimentation, survey techniques, and the construction and interpretation of statistical models.

98904 COASTAL BIOLOGICAL RESOURCES
Three semester hours
Prerequisites: Coastal Resource Management 1; Biological systems; Environmental Economics and Ecologically Sustainable Development

Freshwater, estuarine and marine biological resources and their exploitation will be examined. Problems of productivity against a background of regulations will be studied, and the major management requirements for ecologically sustainable development of coastal resources will be addressed.

98905 RESOURCE MEASUREMENT AND ASSESSMENT
Three semester hours
Prerequisites: Experimental Design for Resource Management; Coastal Biological Resources

This subject will introduce students to methodologies of biological surveys, field measurement, sampling, analysis and assessment in coastal systems. The principles of baseline surveys, biomonitoring, and impact assessment, in systems such as mangroves, saltmarshes, seagrass beds, estuarine and lagoon waters and sediments, and marine systems, will be developed.

98906 COASTAL RESOURCE MANAGEMENT 2
Three semester hours
Prerequisite: Coastal Resource Management 1.

An overview will be given of the nature and sources of problems in coastal resource management. The complementary roles of technical and regulatory approaches will be compared. The balance of development and conservation will be explored with respect to policies relating to: public land; urban and industrial development; dunes, beaches, and mineral sands; estuaries, ports and marina developments; fisheries resources and products; hazard and risk assessment; and total catchment management.

98907 POLLUTION ASSESSMENT AND MONITORING
Three semester hours
Prerequisites: All first semester subjects.

This subject concentrates on the sources, impacts, and control of pollutants on coastal systems. The ecological characteristics of natural and disturbed habitats will be compared. The ecological and public health impacts of pollution will be considered. The objectives, approaches, design and evaluation of monitoring programmes will be studied, including remote sensing and other techniques. Oil spill fingerprinting and clean-up strategies will be introduced, and the role of regulatory and management agencies considered.

98908 INTEGRATED ENVIRONMENTAL ASSESSMENT AND MANAGEMENT
Three semester hours
Prerequisites: All first and second year subjects.

As Integrated Environmental Assessment (IEA) and Integrated Environmental Management (IEM) require analysis of complex systems which cannot be undertaken from a single disciplinary base, this subject is for advanced students only. It synthesises the multidisciplinary content of the preceding modules, through application to specific cases. Students will be required to think holistically; to undertake complex systems analysis; to select and apply philosophies, concepts, methodologies and techniques appropriate to the particular problem. An IEA/IEM case study will be completed, with tight budgetary, time and performance requirements.

98990 INDIVIDUAL RESEARCH PROJECT IN COASTAL RESOURCE MANAGEMENT
Three semester hours
Prerequisites: Completion of at least three semesters of coursework.

Normally in their final semester, each student will complete the requirements for the Masters degree by carrying out an individual coastal resource management research project, submitting a report, and giving an oral presentation of the work and its significance. Studies may be in the form of laboratory or field investigations, a management review, a case study, or similar undertaking appropriate to the student's individual needs and interests.

THE STUDENTS' ASSOCIATION (SA)

The Students' Association (SA) is the elected representative body of students at the UTS - it is an organisation run by students for students. All students become members of the Students' Association upon enrolment. It is the only body in the university which can legitimately claim to truly represent the concerns, issues and problems students face on a day-to-day basis whilst at this university. All students have the right to stand for election of the SA and to vote in the annual elections. There are twenty three general representatives on the Council that makes policy for the Students' Association. The SA also has specialised portfolios and office bearers to deal with a range of issues; the environment, women, students with special needs, gay and lesbian rights, overseas students and postgraduates.

The Students' Association maintains close links with student organisations from other universities. Its political role is to defend and extend educational standards and conditions for students both within the University and the tertiary sector as a whole. Campus Committees deal with campus specific issues (St Leonards/Gore Hill, Balmain, Kuring-gai, Haymarket and Broadway). This has proved to be the most effective and equitable means of ensuring that all campuses are adequately represented in the make-up of the SA. At this level, Campus convenors carry out the directions of campus committees, which are also elected annually.

In general the SA plays a representative and advocacy role on behalf of students. The SA acts as the voice of the student body. As part of this function it produces a fortnightly newspaper, *Vertigo*, and a weekly radio show on 2SER *Student Voice*. It liaises closely with the University Union, which provides services to students (eg the cafeteria, reading and leisure areas) and the Student Services Unit, which is funded by the university to provide welfare advice and counselling loan assistance and medical services. The SA also employs specialised education staff to assist in enquiries about Austudy, HECS, appeals against exclusion and assessment grades and any other problems that students encounter at UTS. The SA has lots to offer all students - so get down to your SA and get active!

Locations and Services

City Campus (02) 330 1155
The main office of the SA is located on the City Campus, Broadway on Level 3A of the Tower Building (near the bar and cafeteria) and offers the following services:

- General Student representatives
- Elected office bearers - Womens' officers
- Overseas students' officers
- Special needs officers
- Gay and lesbian officers
- Environment officer
- Postgraduate officer
- Specialist education, research and welfare staff
- General student enquiries
- Academic coaching service
- Photocopying
- Funding of PERC Clubs

Broadway Resource Centre (02) 3301161
Also located on Level 3A and adjacent to the Union Shop, its services include:

- Photocopying
- Secondhand books
- Use of typewriters and computers
- Book binding and paper guillotining

Haymarket Resource Centre (02) 330 3409
This is located in Room B110 and its services include:

- Photocopying
- Secondhand books
- Typing service

Design School Student Centre (02) 330 2958
This is located on the Balmain Campus, Mansfield Street, Balmain and is open Tuesday to Friday and offers:

- Photocopying
- Secondhand equipment sales
- Computer facilities

Gore Hill Resource Centre (02) 330 4040
This is located in Room 1/18 in the Dunbar Building and its services include:

- Photocopying
- Secondhand books
- Computer facilities

Kuring-gai Campus (02) 330 5237
Located next to State Bank, the services offered include:

- General and campus representatives
- Specialist education, research and welfare staff
- General student enquiries
- Resource Centre

PRINCIPAL DATES FOR 1992

AUTUMN SEMESTER

January

13 Release of HSC results
20 Closing date for changes of preference of 1991 NSW HSC applicants (4.30pm)
26 Australia Day
27 Public School Holidays end
29-31 Enrolment of continuing students at City Campus

February

3-21 Enrolment of continuing and new students at City Campus
17-28 Enrolment at Kuring-gai Campus
25-27 University Orientation Day at City Çampus
28 University Orientation Day at Kuring-gai Campus

March

2 Classes commence
13 Last day to enrol in a course or add subjects
27 Last day to apply for leave of absence
31 HECS Census Date

April

10 Last day to drop a subject without academic penalty
10 Last day to withdraw from course without academic penalty
13 Public School Holidays commence
17 Good Friday
20 Easter Monday
20-24 Vice-Chancellors' Week (non-teaching)/ Graduation period
24 Public School Holidays end
25 Anzac Day

May

29 Closing day for applications for Spring Semester

June

15 Formal examinations commence

SPRING SEMESTER

July

3 End of formal examinations
6 Public School Holidays commence
6-10 Vice-Chancellors' Week (non-teaching)
17 End of Public School Holidays
27-31 Enrolment of new students

August

3 Classes commence
14 Last day to enrol in a course or add subjects
28 Last day to apply for leave of absence
31 HECS Census Date

September

11 Last day to drop a subject without academic penalty
11 Last day to withdraw from a course without academic penalty
28 Public School Holidays commence
30 Undergraduate applications close for admission in 1992
28- Vice-Chancellors' Week (non-teaching)/
2 Oct Graduation period

October

9 End of Public School Holidays

November

16 Formal examinations commence

December

4 End of formal examinations
18 Public School Holidays commence

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